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(71) Applicant *(for all designated States except US)*: TECH-METRICS INTERNATIONAL, INC. [US/US]; Suite 100, 14555 North Scottsdale Road, Scottsdale, AZ 85258 (US).

(72) Inventors; and
(75) Inventors/Applicants *(for US only)*: GUINTA, Lawrence, R. [US/US]; 9743 East Sharon, Scottsdale, AZ 85260 (US). FRANTZVE, Lori, A. [US/US]; 9743 East Sharon, Scottsdale, AZ 85260 (US).

(74) Agent: NOBLITT, Daniel, J.; Snell & Wilmer, One Arizona Center, 400 East Van Buren Street, Phoenix, AZ 85004-0001 (US).

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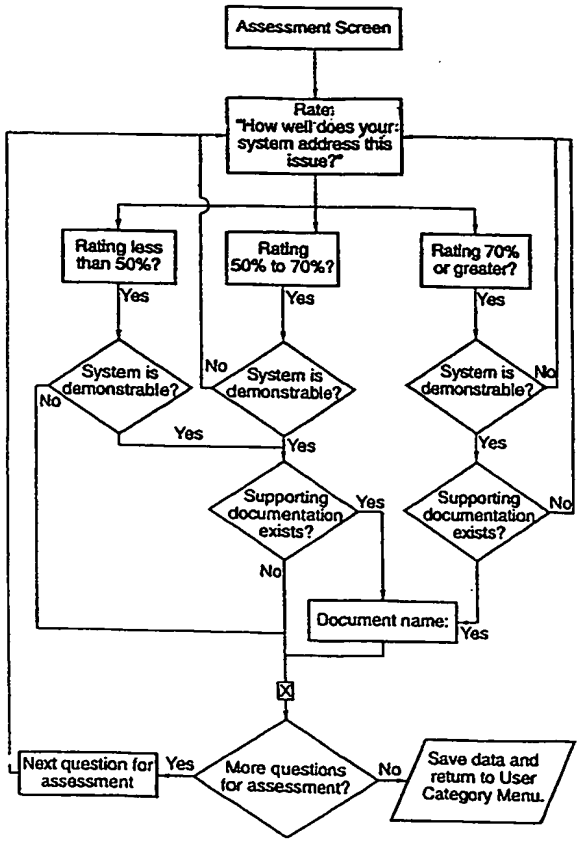
(54) Title: COMPUTER-AIDED METHODS AND APPARATUS FOR ASSESSING AN ORGANIZATIONAL PROCESS OR SYSTEM

(57) Abstract

Method and apparatus for computer-aided assessment of organizational process or system. Method and apparatus are adapted to display questions on a computer to an assessor, who then inputs numerical and/or textual inputs relative to the assessor's perception of the process or system. Filtering techniques inhibit entry of unsupported numerical and/or textual inputs which may be untrue and/or exaggerated. Questions used in combination with additional questions provide more accurate assessment of the system or process, where the question combinations are already existing in a database. Evaluations of collected information are performed and additional corrective action questions are asked to identify degrees of risk and areas of weakness of the process or system.



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COMPUTER-AIDED METHODS AND APPARATUS FOR ASSESSING AN ORGANIZATIONAL PROCESS OR SYSTEM

CROSS-REFERENCE TO RELATED APPLICATION

This application is a continuation-in-part of U.S. Patent Application Serial No. 08/351,896, filed on December 8, 1994.

BACKGROUND OF THE INVENTION

1. Field of the Invention

The invention relates to computer-aided methods and apparatuses for assessing organizational processes or systems.

2. Description of the Related Art

Large entities such as corporations, professional associations, and government units often perform organizational assessments both within their own organizations and those of third parties, such as corporate divisions, subsidiaries, departments, and third party providers. The assessments can cover a wide range of topics, often relating to such matters as safety, efficiency, cost control, and reliability. Conventionally, such evaluations have been conducted in conjunction with on-site audits and inspections. Such audits and inspections, however, tend to be burdensome, expensive, and time consuming for both the assessing and audited entities.

To reduce the burdens associated with these evaluations, surveys are commonly employed to gather information concerning organizational processes or systems. A problem with surveys, however, is that validation of the accuracy and truthfulness of answers received is often difficult and expensive, especially when responses are prepared by potentially biased persons, such as suppliers of goods and services.

Another problem with conventional survey techniques is associated with generating an optimal structure for the survey. For example, a useful data gathering technique called "conditional response" involves presenting an assessor a question, and based on the answer to the question, branching to one or more subsequent questions. Each subsequent question may then also branch to further subsequent questions based on answers provided. In this manner, a

complicated "tree" of questions and answers may be prepared. One problem with the conditional response technique, however, is that the assessment criteria which direct branching are highly subjective. Thus, the person developing the criteria may bias the survey. Furthermore, preparing or revising a conditional response survey tends to be difficult and expensive since the "tree" is highly structured, thus making preparation of the tree, or revisions to the tree, complicated, time consuming and cumbersome. For instance, if an early question in the tree is changed, then a whole series of subsequent "branching" questions may also have to be changed.

A further problem with the conditional response technique is that available answers tend to be absolute in nature. For example, responses to the questions typically demand a "yes" or a "no" with no option for a qualified response. It is often useful, however, to use other types of questions demanding nonabsolute responses. For example, a survey may call for responses such as numerical responses, multiple choice responses, arbitrary textual responses, or multiple choices from a number of selections (e.g. "check all that apply"). Although these nonabsolute responses are often useful, adapting them to the conditional response technique often proves complicated and cumbersome.

SUMMARY OF THE INVENTION

A method and apparatus according to various aspects of the present invention uses a computer to gather information about an organizational process or system by asking an assessor for information about the organizational process or system. Information is gathered by displaying questions on a computer and storing the assessor's responses. As the information is gathered, the responses are analyzed. The analysis performs various functions, such as identifying relevant subject matter, identifying appropriate personnel for submitting responses, accumulating information and evidence relating to the subject matter, filtering biased or exaggerated responses, and identifying potential solutions or improvements.

BRIEF DESCRIPTION OF THE DRAWING

A more complete understanding of the present invention may be derived by referring to the detailed description and claims when considered in connection with the figures, and:

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Figure 1 depicts an apparatus including a computer, a display device, and an input device.

Figure 2 depicts a general chart of an assessment process according to various aspects of the present invention.

Figure 3 depicts a general chart of an exemplary assessment initiation system.

Figure 4 depicts a flow-chart wherein an assessor is prompted to input a numerical input reflective of how well a system addresses an issue.

Figure 5 depicts a flow-chart wherein an assessor is prompted to input a numerical input reflective of how extensively a system is deployed.

Figure 6 depicts a flow chart wherein an assessor is prompted to input a numerical input reflective of results achieved by the system.

Figures 7A-7E depict a series of "sliding bar" displays.

Figure 8 depicts a flow chart for a corrective action system.

DETAILED DESCRIPTION OF THE INVENTION

The subject matter of the present invention is particularly suited for use in connection with methods and apparatus for assessing an organizational process or system, such as computer-aided systems for measuring, evaluating, and gathering information about organizational processes and systems. As a result, the preferred exemplary embodiment of the present invention is described in that context. It should be recognized, however, that the description is not intended as a limitation on the use or applicability of the present invention, but is instead provided merely to enable a full and complete description of a preferred embodiment.

Referring now to Figure 1, a computer system suitable for implementing an organizational assessment system according to various aspects of the present invention comprises a conventional desktop personal computer system 100. The computer 100 may be configured in any suitable manner to implement various aspects of the present invention. For example, the computer 100 may include a memory 110 and a processing unit 112. The computer 100 may be further adapted, using any suitable computer software or hardware, to perform the various functions as described herein. In the present embodiment, the computer may comprise an IBM or Apple compatible computer, such as a Sytech 486166 or a Dell 433SINP. Alternatively, the computer 100 comprises any appropriate computer system, such as a mainframe computer, a minicomputer, a network server, or any other suitable computer system.

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In the present embodiment, the computer 100 includes various interfaces to operate in conjunction with an assessor. For example, the computer 100 is suitably connected via a line 106 to a display device 102 to provide information to a human assessor, such as a computer screen like a Sony Multiscan 17se or a NEC MultiSync 3FGe computer screen. The computer 100 is also suitably connected via a second line 108 to an input device 104 to facilitate the submission of information by the human assessor. The input device 104 of the computer may be a keyboard, a mouse, or a touch screen. In some instances the input device 104 may include a speech recognition device that converts spoken words into machine-readable inputs. Additional or substitute input and output devices, such as modems, printers, speakers, voice recognition circuitry, or any other suitable input or output device may be connected to the computer 100 to facilitate communication with the human assessor or another computer system.

The computer 100 suitably operates in accordance with at least one program to perform various functions in accordance with various aspects of the present invention, such as displaying questions, receiving and storing responses, comparing responses to various values, and preparing reports. A human assessor interacts with the computer and the program, for example in conjunction with a series of computer-driven questions. Typically the assessor has at least some knowledge about the organizational process or system. At least some of the computer-driven questions are adapted to prompt an assessor to submit via the input device 104 a response relating to the capability of the organizational process or system to address an issue.

For example, referring now to Figure 2, in accordance with an exemplary embodiment of an organizational assessment system according to various aspects of the present invention, a suitable organizational assessment system comprises: an assessment initiator system 210; an information gathering system 212; and a corrective action system 214. The assessment initiator system 210 is suitably initiated first, for example to identify appropriate personnel, subject matter, general organizational characteristics, or other generalized information. The information gathering system 212 may then be implemented, suitably subsequent to and in accordance with the results generated by the assessment initiator system 210, to accumulate information relating to the relevant processes or systems. The corrective action system 214 may also be initiated, suitably subsequent to and in accordance with the results generated by the information gathering system 212, for example to identify significant problems and potential solutions. Although each of these systems suitably operates in conjunction with the others in the present embodiment, each of the systems may be configured to operate independently or with less than all of the other

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systems or features. Further, each of these systems may operate on the same or different computers 100 and may interact with the same or different human assessors.

In the present embodiment, the assessment initiator system 210 is suitably configured to identify knowledgeable personnel, acquire general organizational information, and perform any other function for facilitating the organizational assessment and the proper performance of the information gathering system 212 or the corrective action system 214. In the present embodiment, the assessment initiator system 210 reads a series of questions from a memory in the computer 100 and provides them to a primary human assessor via the display device 102. The questions may be formatted as a single series of questions or provided in any other suitable format, such as in a conditional response format. The primary human assessor is suitably a person with broad knowledge relating to the organization to be assessed, such as a company president or the head of a division. The assessment initiator 210 may also operate in conjunction with multiple human assessors, each providing independent responses and information to the questions posed by the assessment initiator system 210.

Referring now to Figure 3, the assessment initiator system 210 suitably performs multiple stages. For example, the assessment initiator system 210 may initially request general information about the organization (step 310). Such general information might include the organization's name, address, type, size, character of its business, and the like.

The assessment initiator system 210 may further suitably request information regarding the characteristics and capabilities of the relevant organization (step 312). For example, the human assessor may be asked questions such as whether the organization has a manufacturing department, a legal department, an accounting department, or the like. Data acquired by the assessment initiator system 210 relating to the organizational characteristics may be useful for identifying general issues and selecting particular groups of questions to be presented by the assessment initiator system 210, the information gathering system 212, and the corrective action system 214.

Upon entry of such information by the human assessor, the assessment initiator system 210 suitably generates at least one question configured to identify personnel with substantive knowledge of specific subjects pertinent to the assessment (step 314). Such personnel may include, for example, high-ranking employees, supervisors, board members, officers or the like. For example, a first question may request the name and office location of the director of purchasing, and a second question may ask for similar information for the director of human

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resources. Any number of questions may be posed to identify any number of persons or departments likely to possess relevant information. The nature of these questions may be adjusted according to previous information submitted by the human assessor. For example, if the human assessor previously indicated that the organization has no computer system, questions for identifying the director of computer systems may be omitted. Similarly, if the human assessor indicated that the organization has a legal department, the assessment initiator system 210 may request further information, such as names and office locations for the general counsel, chief patent counsel, and chief litigation counsel.

An organizational assessment system according to various aspects of the present invention further suitably implements the information gathering system 212 to gather specific information relating to the relevant organization. In the present embodiment, the information gathering system 212 operates in conjunction with a database of questions stored in the memory 110 of the computer 100 to generate at least a portion of a set of questions to be provided to a human assessor by the information gathering system 212. Further, information received by the assessment initiator system 210 is suitably used to formulate the set of questions provided to the human assessors. For example, if the results of the assessment initiator system 210 indicate that the subject organization performs no manufacturing, questions stored in the memory 110 relating to manufacturing issues may be omitted.

Generally, the information gathering system 212 poses a series of questions, suitably in a conditional response format, to acquire information. The questions are suitably posed and the responses stored and analyzed, for example to establish the validity and substantiation of the responses. For example, a first input may be received from the input device of the computer system in response to a first question. The first input is stored in the memory of the computer, and the first input may reflect the assessor's perception of the capability of the organizational process or system to address an issue.

Once the first input is received, it is suitably compared within a processing unit of the computer to a first value. If the first input has a first predetermined characteristic in relation to the first value then the method may involve prompting the assessor to identify evidence that supports the first input. A "predetermined characteristic" may be defined to mean, for example, that the input has a value at least as great, greater than, equal to or less than, or less than the first value. If the evidence is identified by the assessor that supports the first input, then the method may involve validating the first input for subsequent evaluation. If evidence is not identified that

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supports the first input, then the method may involve inhibiting validation of the first input until the evidence is identified or until the first input is changed to have a second predetermined characteristic in relationship to the first value.

The comparison and validation methods outlined above have the effect of "filtering" data to remove unsupported, biased, erroneous, or exaggerated data. For instance, an assessor may be prevented from entering a favorable rating that is, *e.g.*, above the first value, if the assessor cannot identify evidence to support that favorable of a rating.

In a preferred embodiment, the first input may be a numerical input on selected from a scale, for example a 0-100% scale, a 1-3 scale, a 0-10 scale, or a 1-100 scale. This scale may be a sliding bar scale. For instance, the display device may display the following "issue" presented in the form of a statement:

> Responsibilities and authorities for all personnel affecting quality are clearly defined and documented.

At this point the assessor may be asked "How well does your process (or system) address this issue?" The assessor may then input on a sliding scale of the computer (*e.g.*, typically using arrow keys on a computer keyboard) his or her perception of how well the organization process (or system) addresses the above-referenced issue.

To illustrate, in one example the assessor might enter in a value of 65%, with 100% being the best evaluation and 0% being the worst evaluation. In such example, the first value may be, for example, 50%, and the first predetermined characteristic may be defined to mean that the first numerical input is greater than the first value. In this example, since the first numerical input (65%) is greater than the first value (50%), the first numerical input meets the first predetermined characteristic, and therefore the assessor may then be prompted to identify evidence that supports the first numerical input. Such "evidence" may be in various forms. For instance, it may be visible evidence that is simply affirmed by the assessor. In other embodiments it may be documentary evidence that is identified by name by the assessor.

In an alternative embodiment of this invention, the first input may be a true/false or yes/no input, a numerical input, or a textual input. In addition, the first input may be a selection of only one item from a list of several choices. For example, with reference to the above illustration, an assessor may be asked to select one from the following list in response to the statement: very well, adequately, not well, not at all. Alternatively, the first input may be a selection of one or

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more applicable items from a list of several choices.

In one embodiment the "evidence" may be affirmed by the assessor if the assessor indicates that the process or system is demonstrable (*i.e.*, can be demonstrated). If the process or system is demonstrable, then the first numerical input may be validated for subsequent evaluation. If the system or process is not demonstrable, then validation of the first numerical input may be inhibited until the assessor indicates that the system or process is demonstrable or until the assessor changes the first numerical input to have a second predetermined characteristic in relationship to the first value. In this context, "validation" means that the numerical input is accepted by or into the computer for future evaluation.

In some embodiments, if evidence is not identified that supports the first input, then the display of subsequent questions may be inhibited until the evidence is identified or until the first input is changed to have the second predetermined characteristic in relation to the first value.

In an embodiment of the invention the "second predetermined characteristic" may be defined to mean that the first input is less than the first value. In the example given above, if the first value is 50% and the assessor indicates that the first input is 65%, then the assessor may be asked to indicate that the process or system is demonstrable. If the assessor does so, then validation and/or display of subsequent questions proceeds. If the assessor does not, then validation may be inhibited, and/or the display of subsequent questions may be inhibited, until the assessor indicates that the process or system is demonstrable, or until the assessor changes the first input to be below 50% (*e.g.*, 45%).

In an embodiment of the invention further computer-driven questions may be displayed on the display device. These computer-driven questions may be adapted to prompt the assessor to input a second input on the input device of the computer. The second input may reflect the assessor's perception of how extensively the organizational process or system is deployed (*i.e.*, how extensively the organizational process or system is actually used). For instance, after the first input is validated, the assessor may be asked to indicate how well the process being assessed is deployed. At this point the assessor may again answer a value (*e.g.*, a percentage value on a 0-100 scale) that is indicative of how well the system or process is deployed. The term "how extensively the organizational process or system is deployed" refers to an assessment of how extensively processes or systems are actually deployed versus theoretically deployed.

The capability of an organizational process or system to address an issue refers to an assessment as to the ability of the theoretical organizational process or system to address an

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issue. In other words, the first input reflects an assessment as to whether the organizational process or system can address an issue. The second input then reflects how extensively the organizational process or system is actually deployed to address that issue. In other words, does the assessed process or system actually operate or does it sit on the shelf and/or only theoretically operate? For instance, a process or system may have a high (*e.g.*, 90%) first input indicating that the process or system has a favorable ability to address the issue, but the second input may relatively low (*e.g.*, 30%), indicating that process or system is not widely deployed.

Superior results have been achieved by prompting these questions together in conjunction with filtering techniques (*see, e.g.* Table 2 and accompanying text below). The results are achievable because an apparatus adapted to prompt these combinations of questions in conjunction with filtering techniques can address the following two phenomena frequently encountered when assessing a process or system: (1) a process or system is not supported by evidence but the users nevertheless use this process or system, or (2) the process or system is supported by evidence but it is not used. If either of these phenomena are present, then the first input relating to the assessed process or system may be dependent on knowledge embedded within workers. These workers, however, may quit, retire, be promoted, or otherwise cease performing, all without "passing on" the knowledge which enabled the assessed process or system to achieve the first input. Thus the stability of the first input is questionable if either of these two phenomena are present.

The filtering techniques provide information concerning the first phenomenon. As described above, these filtering techniques also tend to inhibit favorable first inputs that are unsupported. Thus these filtering techniques also increase the accuracy of the first input if the first phenomenon is present. The second input provides information concerning the second phenomenon. This information can be used with the first input in subsequent evaluations (*e.g.*, by mathematical manipulation such as multiplying the first input by the second input to obtain a combined input value). Thus an apparatus adapted to prompt the first and second numerical inputs, in combination with the filtering techniques, has the effect of providing information about, and/or increasing the accuracy of, the first input. The above-described information that is provided "about the first input" can be reflective of the stability of the first input.

In the above-described manner an assessor may be prompted to provide filtered numerical inputs that can together be used to evaluate the process or system. For instance, a first numerical input may be multiplied by a second numerical input (*e.g.*, 90% X 30% = 27%) to provide a

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multiplied evaluation factor that combines the characteristics of both inputs. Alternately, a plurality of first numerical inputs from various assessors may be used, and one or more standard deviations for the first and second numerical inputs may be calculated and compared or used in combination with each other for evaluation purposes. A wide variety of issues may be surveyed by a wide variety of assessors. See Table 1 for issues that may be presented.

Many types of filtering techniques may be used in evaluating the inputs. For example, any sort of mathematical manipulations can be used, include multiplying, adding, subtracting, dividing, calculating standard deviations between, the first numerical input with the second numerical input, or vice versa.

The results of the filtering techniques may be evaluated to determine problem areas that might warrant on-site investigation. For instance, if 100 different issues were assessed by 10 different assessors, the average multiplied evaluation factor might be 55 %, with only 8 issues being below 45 %. On-site evaluation teams might then be directed to focus their efforts on investigating the 8 issues that were below 45% instead of all 100 issues, thereby saving manpower and expense. Alternately, the on-site teams could be directed to investigate issues that had standard deviations above a certain value (*e.g.*, 8%). Again, the efforts of the on-site team would be focused and reduced, thereby saving manpower and expense.

Information or data collected may be further driven or sent to a printer or data collection device such as a memory in a computer. Further evaluation may be achieved by having one computer or control system automatically interact with another, wherein the second computer or control system is requested to gather or retrieve further data for validation or evaluation purposes. For instance, the second computer or control system may be adapted to provide information that verifies or confirms that numerical inputs are reasonably accurate.

Figure 4 demonstrates an embodiment of the invention which includes an assessment screen adapted to display a question in the form or a statement or issue. For the purposes of this patent it is to be understood that a "question" may be presented in multiple ways. For instance, a question may be a standard "yes/no" or "true/false" answer form (*e.g.*, Does the ABC system maintain on-time performance records?). In addition, the question may be presented by making a statement, or stating an issue, and then asking the assessor to evaluate the statement or issue on a numerical scale. For instance, the assessor may be presented with the statement that "the ABC system maintains on-time performance records." In response thereto, the assessor may enter a value on an analog scale reflecting the accuracy of the statement (*e.g.*, 6 on a 1-10 scale,

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with 10 being the most favorable rating).

In Figure 4 a series of statements or issues (such as those depicted in Table 1) are shown on the assessment screen. The following question is then displayed:

"How well does your system address this issue?"

At this point, the assessor is prompted to input a numerical input, on an analog percentage scale, which reflects how well the assessed system addresses the issue. As shown by the arrows in Figure 4, if the rating is less than 50%, then the assessor may be asked if the system is demonstrable. If the answer is "no," then additional displays may be shown as represented by Box X in Figure 4. If more questions are scheduled to be presented to the assessor, then the process or apparatus may proceed to the next question for assessment. If no more questions are scheduled, then the data may be saved and the assessor may be returned to a user category menu.

To illustrate, in Figure 4, the apparatus may be adapted such that the first value is 50% and the first characteristic in relationship to the first value is whether the first numerical input (*i.e.*, the initial rating) is greater than 50%. The second characteristic in relationship to the first value is whether the first numerical input is less than 50%. The "evidence" is whether the assessed system is demonstrable (*i.e.*, can the system be demonstrated?). Subsequent evidence may be requested in the form of supporting documentation. For instance, if the assessor indicates that the assessed system is demonstrable, then the assessor may be asked to indicate whether supporting documentation exists. If supporting documentation exists, then the assessor may be asked to indicate document names. If supporting documentation does not exist, then the assessor may proceed to Box X.

In Figure 4, the first numerical input may be compared to other values besides the first value (the first value in this application acts as a trigger point, or set point). For instance, the first numerical input may be compared to determine if it is between 50-70%. If the first numerical input is between 50% and 70%, then the assessor may be asked to indicate whether the system is demonstrable, as shown in Figure 4. If the system is not demonstrable, then the assessor may be asked to change the rating. In other words, the system shown in Figure 4 may inhibit display of subsequent questions if evidence (*e.g.*, system demonstrability) is not presented that will support ratings in the range of 50-70%. In Figure 4, if the first numerical input is between 50-70% and the system is demonstrable, then the assessor is asked further questions as outlined

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above for Figure 4 (*e.g.*, if supporting documentation exists. etc.).

The system in Figure 4 also has the capability of comparing the first numerical input to a third value. As shown in 1. if the first numerical input is 70% or greater, then the assessor is asked to determine if the system is demonstrable. If the system is not demonstrable, then the apparatus inhibits display of subsequent questions until the assessor changes the rating (*i.e.*, lowers the first numerical input below 70%). Furthermore, the assessor is subsequently asked if supporting documentation exists. If the assessor indicates that no supporting documentation exists, then again the display of subsequent questions is inhibited until the assessor indicates that supporting documentation exists or changes the first numerical input to a lesser value.

In Figure 4, Box X may indicate that the first numerical input is validated. In this context "validation" may simply mean that the first numerical input is stored, that the assessor is not inhibited from proceeding to subsequent questions, and/or that the display of subsequent questions is not inhibited.

The apparatus shown in Figure 4 has the effect of "filtering" assessment indicia. As shown in Figure 4, as the rating (*i.e.*, numerical input) becomes more favorable (*i.e.*, higher), then greater levels of evidentiary support are required. If the rating is less than 50%, then the assessor may still proceed to Box X even if the assessed system is not merely demonstrable. Of course, if the assessed system is demonstrable, then information is received by the apparatus, and if the supporting documentation exists, that information is also received by the apparatus. If the first numerical input is between 50-70%, then a greater level of evidence is required before the assessor can proceed to Box X. Specifically, at least system demonstrability must be indicated. Otherwise the assessor must change (*i.e.*, lower) the first numerical input. Again, if supporting documentation exists, the information is received by the apparatus. Finally, if the numerical input is 70% or greater, then system demonstrability and supporting documentation must exist. Otherwise the assessor must change the first numerical input to a lesser value.

In effect, the apparatus shown in Figure 4 filters the data collected by inhibiting validation/collection of exaggerated, untrue, and/or unsupported numerical inputs. Furthermore, as a numerical input becomes more favorable, then the level of support required for that rating also increases.

The numerical input shown in Figure 4 may be modified based on a wide variety of factors preferred by the apparatus designers. For instance, in some apparatus lower ratings may be preferred (*e.g.*, a rating system of 1-10, where 1 is the most favorable rating). In such case,

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appropriate revision of the levels of evidence as correlated to numerical inputs would be required. In some instances numerical inputs may be utilized to indicate specific events or circumstances (*e.g.*, 1=daily, 2=weekly, 3=monthly, 4=yearly, or 1=always, 2=sometimes, 3=never, etc.)

In Figure 4, Box X may represent a series of subsequent questions presented to the assessor. For instance, Box X may be represented by the system shown in Figure 7. In Figure 7 a question may be displayed on a display device which would ask for a second numerical input reflecting the assessor's perception of how extensively the organizational process or system is deployed. Again, a filtering apparatus may be employed in conjunction with the second numerical input to correlate more favorable ratings with varying levels of evidence. This filtering apparatus may be similar to the Figure 4 filtering apparatus. Depending on the level of the second numerical input, then varying levels of evidence may be required to arrive at Box Y. Box Y may serve similar purposes as Box X. That is, it may serve to validate the second numerical input, or represent subsequent questions to be displayed to the assessor.

Figure 6 depicts a system analogous to that of Figure 4, except the initial questions is:

"How well would you rate the results achieved by the system?"

In Figure 6, a third numerical input is input into the system, the third numerical input reflecting the assessor's perception of the results achieved by the organizational process or system. A filtering apparatus similar to the filtering system shown in Figure 4 may also be employed. Box Z in Figure 6 may represent subsequent questions to be asked.

Preferred embodiments of the invention may employ the apparatus of Figure 4 with the apparatus of Figure 7, the apparatus of Figure 4 with the apparatus of Figure 6, the apparatus of Figure 4 with the apparatus of Figures 2 and 3, and the apparatus of Figure 7 with the apparatus of Figure 6. Furthermore, the order of the apparatus may be reversed or mixed. For example, questions presented in the apparatus of Figure 7 may be asked first followed by questions in the apparatus of Figure 4.

An apparatus of the invention combining Figure 4 with Figure 7 may provide superior evaluation results. It is believed that the superior results may be achieved because the apparatus of Figure 1 provides an assessment as to how well a system may address an issue, however it doesn't provide an assessment on how extensively the system is deployed. Thus a system may work (*i.e.*, address an issue) particularly well (*i.e.*, greater than 90%); however it may only

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minimally deployed. By using Figure 4 and Figure 7, an assessment as to the capability of the system combined with an assessment as to system deployment may be achieved. For instance, if the system addresses the issue particularly well (*i.e.*, at 90%) but is only 60% deployed, then in one embodiment a combined assessment of 90% x 60% = 54% may be calculated. Such combined assessments may be particularly helpful to focus on-site assessment team efforts.

Figures 7A-7E depict a series of screen displays for the VIRTUAL ASSESSOR (formerly MAXUS and MAXSYS) process/apparatus provided by Tech-Metrics International, Inc (Scottsdale, Arizona). As shown in Figure 7A, the following initial "issue" or statement within the category "management responsibility" is displayed: "Quality policy is communicated, understood and maintained throughout the organization." The assessor is then prompted to input, on a sliding bar 0-100% scale, a first numerical input that reflects his or her perception as to how well the assessed process (or system) addresses this issue. As shown in Figure 7B, the assessor in this example input a first numerical input of 58%.

At this point the assessor is prompted (*i.e.*, the word "yes" is highlighted) to indicate whether the system is demonstrable or not. Such indication may be made by the assessor pressing the "enter" key when "yes" is highlighted. To indicate "no" the assessor may use an input device to move the highlight so that "no" is highlighted instead of "yes" and then pressing the "enter" key. If the first numerical input of 58% is higher than a first value (*e.g.*, higher than 50%), then the assessor may be required to indicate that the assessed system is demonstrable. Otherwise the apparatus may inhibit display of subsequent questions and/or prompt the assessor to provide a new (and in this case a lower and less favorable) first numerical input. In this example the assessor indicated "yes" so subsequent questions were not inhibited and the assessor was not asked to input a new numerical input.

As shown in Figure 7C, the apparatus then prompted the assessor to indicate whether supporting documentation existed. If the first numerical input (here, 58%) is higher than a second value (*e.g.*, higher than 60%), then the assessor may be required to indicate that supporting documentation exists. Otherwise the apparatus may inhibit display of subsequent questions and/or prompt the assessor to provide a new (and in this case a lower and less favorable) first numerical input. In this example the assessor indicated "yes" so, as shown in Figure 7D, the apparatus prompted the assessor to identify documents by providing document names.

The "system is demonstrable" and "supporting documentation exists" statements, and their

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associated "yes or no" questions are filtering mechanisms to help inhibit/prevent collection of exaggerated or untrue data. Using known empirically gathered information, the apparatus may be adapted to have first, second, or subsequent values that serve as "trigger" or "set" points to require higher levels of evidentiary support. The theoretical basis for this apparatus is that, on average, filtered perceptions of quality, as indicated by relatively high first numerical inputs, reflect actual conditions. For instance, in the example shown above, a system must be demonstrable to support a first numerical input rating greater than the first value (here, greater than 50%), and then the system must have supporting documentation to support a first numerical input rating higher than a second value (*e.g.*, higher than 60%).

After entering at least one document name in Figure 7D, the display screen shown in Figure 7E may be displayed. Figure 7E prompts the assessor to input a second numerical input which reflects the assessor's perception of how well the process is deployed. In other words, the assessor inputs a numerical evaluation of how extensively the assessed process (or system) is actually used or deployed.

Upon completion of the information gathering system 212, the corrective action system 214 is suitably initiated. The corrective action system 214 suitably analyzes the data accumulated by the information gathering system 212 to identify problem areas and explore resolution of the problems. Referring now to Figure 8, the corrective action system suitably initially analyzes the data gathered by the information gathering system 212 to detect problem areas (step 810). For example, the data for each of the fields, i.e., the topics addressed by the information gathering system 212, may be summarized into a single value for the field. The summary may be generated in any manner, such as statistical methods like finding the mean, median, or mode of numerical responses. To identify specific problem fields, the summarized results are compared to selected thresholds (step 812). The thresholds may be selected in any suitable manner, for example approximating industry average values for such fields or minimum values required to satisfy particular evaluation criteria.

If all of the summary values for the fields exceed the selected thresholds, the corrective action 214 system may terminate. Alternatively, the thresholds may be raised to a level corresponding to an improved state of operation (step 814) and the results analyzed again in view of the new set of thresholds (step 816). In any event, if any of the summarized values fail to exceed the selected thresholds, the particular fields are identified for further analysis (step 818).

Following identification of the relevant fields, the corrective action system 214 generates

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a new set of questions for each of the relevant fields and poses them to the appropriate personnel. In the present embodiment, the appropriate personnel are likely to be the personnel identified in conjunction with the application initiator system 210 as being in charge of the departments associated with the relevant fields. The questions are suitably designed to assess the magnitude of the problem, the cause of the problem, and solutions to the problem. For example, a first set of questions require designation of a responsible person or persons for addressing the problem (step 820). A next set of questions may be designed to determine optimal short-term solutions to the problem to be implemented by the designated responsible person (step 822).

After identifying short-term factors, the corrective action system 214 suitably provides questions relating to a more complete solution of the problem. For example, a set of further questions may be presented to determine the magnitude of the risk and/or potential impact associated with the problems in the field (step 824). Additional questions are suitably presented to identify the fundamental causes of the problem (step 826) and potential solutions for neutralizing those causes and remedying the problem (step 828). Finally, the corrective action system 214 suitably implements a calendaring set of questions configured to interactively generate a timetable for resolution of the problem and performance of a supplementary organizational assessment within the problem fields (step 830).

Once the assessment information is collected and evaluated, reports are created summarizing the information, suitably by the computer 100. For example, these reports might identify an organization's strengths and weaknesses. The report might also suggest guidelines for the organization to improve the weaknesses, for example in accordance with the information accumulated by the corrective action module 214. In the present embodiment, the report generating process may include information relating to the correlation of the respondents' responses, a summary of the respondents' views relating to various issues, additional sources of data identified by the respondents, or any other information which may be suitably drawn from or generated in conjunction with the information obtained by the organizational assessment system.

Although the present invention is directed towards computer-driven assessments, computers may not be available to the assessors who need to answer questions. Therefore, an organizational assessment system according to various aspects of the present invention may be configured to generate a set of questions suitable for printing to hard copy for use. Preferably, the particular selection of questions is generated following a computer-driven implementation

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of the assessment initiator system 210. Based on the responses provided by the human assessor to the assessment initiator system 210, a selection of questions may be derived from a collection of questions stored in the memory 110 of the computer 100. Further human assessors are given hard copies of the questions and answer sheets. The answers sheets typically contain numbers which correspond to the question numbers. Next to the answer sheet numbers are a plurality of circles or other indicia which correspond to the answer choices presented with each question. To answer a question, the assessor darkens the circle or otherwise marks or designates the area which corresponds to the appropriate answer. The answers sheet can then be scanned into the computer and the assessment, including the information gathering system 212 and the corrective action system 214, can be continued on the computer.

Experiment

Table 2 reflects experimental information collected to verify the ability of an embodiment of the invention to accurately access an organizational system. In this experiment a corporation desired to access five external manufacturing locations operated by five of its suppliers of goods/services. The process/apparatus of the invention was used, as described above in conjunction with Table 1, Figure 1, and Figures 7A-7E, to assess these locations. The results for such assessment is shown in the columns labeled TMI in Table 2. The corporation then conducted manual on-site assessments of the five suppliers. The results of the corporation's assessments for these five suppliers is shown in Table 2 under the columns labeled EML1, EML2, EML3, EML4, and EML5. The difference between the corporation's assessments and the assessments prepared using an embodiment of the invention are shown in Table 2 under the columns labeled "+/-." As shown in the last row of Table 2, the average difference between these assessments was -2.27%, thus indicating that, on average, the assessments using an embodiment of the invention were only 2.27% different from the assessments obtained using manual on-site methods. Since the manual on-site methods are much more expensive and time consuming, these results in Table 2 indicate that an embodiment of the invention may obtain comparable results with a greatly reduced cost. Moreover, the assessments prepared using an embodiment of the invention were slightly lower than those prepared using on-site manual inspections, thus producing a slightly more conservative assessment.

In an embodiment of the invention the apparatus and process of the invention may be adapted to compare numerical inputs (relating to a plurality of issues, or categories of issues) for

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a plurality of suppliers. In this manner an objective, relatively quick, and inexpensive assessment of the suppliers may be completed. In this manner industry standards may be established, and on-site evaluations may be directed to focus their inspection efforts in areas that are below, or not within, industry norms.

Although not specifically illustrated in the Figures, it is understood that other additional and necessary materials, apparatus, and structural components will be provided, and that these and all of the components described above may be arranged and supported in an appropriate fashion to form a complete and operative apparatus or process. It is also understood that variations may be made in the present invention without departing from the spirit and scope of the invention.

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TABLE 1	
4.1 MANAGEMENT RESPONSIBILITY	
1.	Quality policy is communicated, understood and maintained throughout the organization. (I.4.1.1)
2.	Responsibilities and authorities for all personnel affecting quality are clearly defined and documented. (I.4.1.2)
3.1	Authority delegated to personnel to prevent nonconformity reoccurrence. (I.4.1.2)
3.2	Authority delegated to personnel to identify & record quality problems. (I.4.1.2)
3.3	Authority delegated to personnel to initiate & verify corrective action. (I.4.1.2)
3.4	Authority delegated to personnel to control further processing. (I.4.1.2)
4.	A multi-disciplinary approach is used in the design process with direct input in decision making. (I.4.1.2)
5.	Periodic top management review of quality system effectiveness is supported by appropriate records. (I.4.1.3)
6.	Qualified technical personnel are available for design, process, product and service support. (I.4.1.2.2)
7.	Management representative with authority & responsibility to ensure standards compliance (i.e. ISO-9000, QS-9000, NQA, etc.) is clearly defined. (I.4.1.2.3)
8.1	Documented business plan(s) consider standard's requirements (i.e. ISO-9000, QS-9000, NQA, etc.) including competitive product analysis. (as applicable) (I.4.1.4)
8.2	Documented business plan(s) considers the standard's requirements (i.e. ISO-9000, QS-9000, NQA, etc.) and benchmarking. (as applicable) (I.4.1.4)
8.3	Documented business plan(s) considers standard's requirements (i.e. ISO-9000, QS-9000, NQA, etc.) and R&D plans. (as applicable) (I.4.1.4)

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TABLE 1	
8.4	Documented business plan(s) considers standard's requirements (i.e. ISO-9000, QS-9000, NQA, etc.) of internal quality and operational performance measures (as applicable) (I.4.1.4)
9.	Data is used to focus on competitors and/or appropriate benchmarks for improving quality, productivity, and operation efficiency. (I.4.1.5)
10.	Documented and objective processes are used to measure customer satisfaction. (e.g.: a plan with short and long term actions addressing customer dissatisfaction factors.) (I.4.1.6)
11.	Cross-functional teams are used for the quality planning process. (I.4.2.1)
4.2 QUALITY SYSTEM	
1.	Quality Manual adequately meets QS-9000 requirements for documentation of a comprehensive quality system.
2.1	Quality planning process is consistent with the elements of the quality system that addresses Product Program plan preparation. (I.4.2.3)
2.2	Quality planning process is consistent with the elements of the quality system that addresses identification and acquisition of the appropriate resources. (I.4.2.3)
2.3	Quality planning process is consistent with the elements of the quality system and addresses conducting design and process compatibility studies. (I.4.2.3)
2.4	Quality planning process is consistent with the elements of the quality system and addresses updating and maintenance of all quality control and inspection methodology. (I.4.2.3)
2.5	Quality planning process is consistent with the elements of the quality system and addresses identification of suitable verification at appropriate stages. (I.4.2.3)
2.6	Quality planning process is consistent with the elements of the quality system and addresses preparation of control plans and FMEAs. (I.4.2.3)
2.7	Quality planning process is consistent with the elements of the quality system and addresses review of standards and specifications. (I.4.2.3)

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TABLE 1	
3.	Feasibility reviews are conducted to confirm the compatibility of design with the manufacturing process, including capacity planning and utilization. (I.4.2.3)
4.	Engineering requirements are met at the required statistical process capability. (I.4.2.3)
5.	Control plans are developed to the subsystem, component, and/or material level. (I.4.2.3)
6.	Control plans include all special characteristics, related process and parameters and are identified as such. (I.4.2.3)
7.	Control plans are revised when appropriate for product and process changes or when processes are found to be unstable or non-capable. (I.4.2.3)
8.	Control plans cover three phases: prototype, pre-launch, production (unless exempted by the customer). (I.4.2.3)
9.	Process FMEAs consider all special characteristics. (I.4.2.3)
10.	Adequate supporting procedures exist for each element of the quality manual. (4.2.2)
11.	Special characteristics have been identified and included in the Control Plan(s). (I.4.2.3.a)
12.	A comprehensive quality system (appropriate to the product or service produced) is established and implemented. (4.2.1)
4.3 CONTRACT REVIEW	
1.	Contract review activities are adequately documented and maintained to ensure that order requirements are understood and are within the supplier's capability prior to order acceptance. (I.4.3.2)
2.	Standard's requirements (i.e. ISO-9000, QS-9000, NQA, etc.) and customer contract requirements are deployed into the quality system. (I.4.3.2)
3.	Provisions to document and deploy contract changes throughout the organization exist. (I.4.3.3)
4.	Contract review records are maintained. (I.4.3.4)

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TABLE 1	
4.4 DESIGN CONTROL	
1.	Design plans for each project have been established and responsibility assigned. (I.4.4.2)
2.	Responsible personnel are experienced in the "required skills" or appropriate equivalents. (I.4.4.2)
3.	Applicable statutory and regulatory requirements are identified. (I.4.4.4)
4.1	Appropriate resources and facilities are available to use computer aided design, engineering and analysis. (I.4.4.4)
4.2	Technical leadership is provided when CAD/CAE is sub-contracted. (I.4.4.4)
5.	Formal documented design reviews are conducted per the design plan. (I.4.4.5)
6.	Design output is documented and expressed as requirements that can be verified. (I.4.4.6)
7.1	Design output meets design input requirements. (I.4.4.6)
7.2	Design output contains or references acceptance criteria. (I.4.4.6)
7.3	Design output includes a review of design output documents before release. (I.4.4.6)
8.1	Design outputs are the result of a process that used the "Design Techniques" or alternatives? (I.4.4.2) & (I.4.4.6)
8.2	Design outputs are the result of a process that used Geometric Dimensioning and Tolerancing (GDT). (I.4.4.6)
8.3	Design outputs are the result of a process that used analysis of cost / performance / risk trade-offs. (I.4.4.6)
8.4	Design outputs are the result of a process that used feedback from testing, production and the field. (I.4.4.6)
8.5	Design outputs are the result of a process that used analysis of design failure mode and effects (DFMEA). (I.4.4.6)
9.	Performance testing (life, durability, reliability) is tracked for timely completion and conformance. (I.4.4.7)

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TABLE 1	
10.	A comprehensive prototype program exists (unless waived by the customer or made unnecessary by the generic nature of the product supplied). (I.4.4.7)
11.	Design validation has been performed at the specified frequencies, results recorded, and failures addressed. (I.4.4.8)
12.	Design changes are documented and approved by authorized personnel before implementation. (I.4.4.9)
13.	Written customer approval or waiver has teen obtained prior to a design change being implemented into production. (I.4.4.9)
	4.5 DOCUMENT AND DATA CONTROL
1.	New and revised documents are reviewed and approved by authorized personnel prior to issue. (I.4.5.2)
2.	A master list (or equivalent) identifies document revision status. (I.4.5.2)
3.	Timely review, distribution and implementation of customer engineering standards, specifications and changes. (I.4.5.2)
4.	All referenced documents are available on-site. (I.4.5.1)
5.	Special characteristic symbols or notations are shown on process control plans and similar documents. (I.4.5.1)
6.	Where documents or data is retained on software, appropriate controls are maintained for changes. (I.4.5.1 & 3)
	4.6 PURCHASING
1.	Subcontractors are evaluated and selected based on their ability to meet quality system and quality assurance requirements. (I.4.6.2.a)
2.	Appropriate level of control over subcontractors is maintained. (I.4.6.2.b)
3.	Quality records of subcontractors are kept up to date and used to evaluate performance. (I.4.6.2.c)
4.	Subcontractor development is conducted using the standard's requirements (i.e. ISO-9000, QSR (Sections I & II), NQA, etc.) as the fundamental quality system requirement. (I.4.6.2)
5.	Purchasing documents contain data that clearly describe the product or service being ordered. (I.4.6.3)

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TABLE 1	
6.	Where applicable, there is provision for the customer (or representative) to verify subcontractor quality on the subcontractor's premises. (I.4.6.4.2)
4.7 CONTROL OF CUSTOMER SUPPLIED PRODUCT	
1.	Material is examined upon receipt to check quantity, identity, and transit damage. (I.4.7)
2.	Material is periodically inspected to detect signs of deterioration, proper conditions & storage time limitations. (I.4.7)
3.	For product that is lost, damaged or otherwise unsuitable for use, records are maintained and reports provided to the customer. (I.4.7)
4.8 PRODUCT IDENTIFICATION AND TRACEABILITY	
1.	Product is identified, where appropriate, at all production stages? (I.4.8)
2.	Traceability is maintained and recorded when required by the customer? (I.4.8)
4.9 PROCESS CONTROL	
1.1	Documented job instructions have been developed and are accessible at each work station. (I.4.9)
1.2	Documented job instructions communicate requirements to all employees involved. (I.4.9)
1.3	Documented job instructions provide for verification of job set-ups and tool change intervals. (I.4.9)
1.4	Documented job instructions specify monitoring of special characteristics. (I.4.9)
1.5	Documented job instructions list requirements for inspection, testing, gaging and recording results. (I.4.9)
1.6	Documented job instructions provide sample size and frequency. (I.4.9)
1.7	Documented job instructions establish approval and rejection criteria. (I.4.9)
1.8	Documented job instructions list required tools and gages (with mastering at required frequency). (I.4.9)

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TABLE 1	
1.9	Documented job instructions describe the identification and handling of non-conforming material. (I.4.9)
1.10	Documented job instructions specify appropriate notifications and corrective actions (including plans for unstable/non-capable processes). (I.4.9)
1.11	Documented job instructions specify application of statistical methods required by control plans. (I.4.9)
1.12	Documented job instructions identify relevant engineering and manufacturing standards and the latest engineering change affecting the instruction. (I.4.9)
1.13	Documented job instructions display appropriate approvals and dates. (I.4.9)
1.14	Documented job instructions display operation name and number. (I.4.9)
1.15	Documented job instructions are keyed to process flow charts. (I.4.9)
1.16	Documented job instructions show part name and number. (I.4.9)
1.17	Documented job instructions show revision date for instructions. (I.4.9)
1.18	Documented job instructions define visual controls. (I.4.9)
2.	Employees perform operations/inspections according to documented instructions.
3.1	Process control requirements are met.
3.2	The customer's preliminary process capability requirements are met. (I.4.9.2)
3.3	The customer's ongoing process performance requirements are met. (I.4.9.3)
3.4	Special causes of variation are investigated and appropriate actions taken. (I.4.9.3)
3.5	Control charts are annotated with significant process events. (I.4.9.3)
3.6	Control charts are maintained and reviewed with highest priority given to special characteristics. (I.4.9.3)

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TABLE 1	
4.1	Planned preventive maintenance system includes a maintenance schedule established with specific responsibilities assigned. (I.4.9.g)
4.2	Planned preventive maintenance system is evaluated for process capability improvement. (I.4.9.g)
4.3	Planned preventive maintenance system is evaluated for reduction of machine/process downtime. (I.4.9.g)
4.4	Maintenance is conducted at the prescribed frequencies for all equipment. (I.4.9.g)
4.5	Planned preventive maintenance system tracks availability of replacement parts for key manufacturing equipment. (I.4.9.g)
4.6	Planned preventive maintenance system uses predictive maintenance methods. (I.4.9.g)
5.	A process exists to identify all applicable government safety and environmental regulations, including those concerning handling, recycling, eliminating, or disposing of hazardous materials. (I.4.9.b)
6.	Possession of appropriate governmental certificates indicating compliance to the identified applicable regulations. (I.4.9.b)
7.	Work environment is clean and well-organized. (I.4.9.b)
8.1	Evaluation areas for "appearance items" have appropriate lighting.
8.2	Appropriate masters of "appearance items" are available.
8.3	"Appearance Item" masters and evaluation equipment are adequately maintained.
8.4	Verification exists that personnel making appearance evaluation are qualified to do so.
4.10 INSPECTION AND TESTING	
1.1	Purchased material is controlled and verified per the selected system prior to release to production. (I.4.10.2)
1.2	Positive identification is provided for material used in production but not verified. (I.4.10.2)
1.3	Where specified as the control method, suppliers submit statistical data. (I.4.10.2)

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TABLE 1	
2.1	Product is inspected and tested as required by the documented procedures. (I.4.10.3)
2.2	Product is held until the required inspections and tests have been completed. (I.4.10.3)
2.3	Defect prevention methods, such as statistical process control, error proofing, visual controls, is used rather than defect detection. (I.4.10.3)
3.1	Final inspection and testing is conducted in accordance with documented procedures. (I.4.10.4)
3.2	Final inspection and testing ensures no product is shipped until all activities specified in the documented procedures have been satisfactorily completed. (I.4.10.4)
4.	Accredited laboratory facilities are used when required by the customer. (I.4.10.1,II.1)
5.1	Layout inspection is conducted per the Control Plan. (I.4.10.4)
5.2	Functional testing is conducted per Control Plan. (I.4.10.4)
6.	Appropriate records are maintained for all inspections and tests. (I.4.10.5)
4.11 INSPECTION, MEASURING, AND TEST EQUIPMENT	
1.	Inspection, measuring, and test equipment (including software when appropriate) has been provided that is capable of the required accuracy and precision. (I.4.11.2.a)
2.	Required accuracy/precision of inspection, measuring, and test equipment is determined. (I.4.11.2.a)
3.	Measurement system analysis is conducted (Gage R & R) for all gages, measuring, and test equipment, noted on the control plan. (I.4.11.4)
4.	Appropriate criteria (per the Measurement Systems Analysis Manual) is used for acceptance of measuring equipment. (I.4.11.4)
5.	Where test software, hardware, or comparative references are used, capability and stability are verified prior to use (linearity and accuracy as appropriate). (I.4.11.2)

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TABLE 1	
6.	Each item of inspection, measurement, and test equipment is identified with a unique designation (including employee-owned equipment)? (I.4.11.3)
7.	Each piece of inspection, measurement, and test equipment is calibrated at prescribed intervals and in the correct environment (including employee-owned equipment). (I.4.11.2.b)
8.	Gage condition and actual readings are recorded prior to recalibration. (I.4.11.2.e)
9.	Appropriate actions, including customer notification, are taken on product and process when inspection, measurement, or test equipment is found to be out of calibration. (I.4.11.2.f)
10.	Inspection, measurement, and test equipment are properly handled, preserved, and stored to maintain calibration and fitness for use. (I.4.11.2.h)
11.	Inspection, measurement, and test facilities (including software when applicable) are safeguarded to insure that calibration is not disturbed. (I.4.11.2.i)
12.	Records exist for recalibration of part-specific gages, etc. following engineering changes. (I.4.11.2)
4.12 INSPECTION AND TEST STATUS	
1.	Inspection and/or test status is suitably identified throughout the production process. (I.4.12.1)
2.	If required by the customer, additional verification requirements are met for launching of new products. (I.4.12.2)
4.13 CONTROL OF NONCONFORMING PRODUCTS	
1.	Systems ensure identification, documentation, segregation (where possible). to a designated area, and disposition of nonconforming and suspect product. (I.4.13.1)
2.	Responsibilities for review and disposition of nonconforming and suspect product are clearly defined. (I.4.13.2)

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TABLE 1	
3.	Nonconforming and suspect products are reviewed according to defined procedures. (I.4.13.2)
4.1	Systems ensure nonconforming and suspect parts are reviewed to specified requirements. (I.4.13.2)
4.2	Systems ensure nonconforming and suspect parts are accepted with customer-approved concessions (EAPAs). (I.4.13.2)
4.3	Systems ensure nonconforming and suspect parts are reworked to approved repair standards. (I.4.13.2)
4.4	Systems ensure nonconforming and suspect parts are regraded for alternative applications. (I.4.13.2)
4.5	Systems ensure nonconforming and suspect parts are rejected or scrapped. (I.4.13.2)
5.	Processes assure that only material that has passed inspections and/or tests can be provided to the customer. (I.4.13.2)
6.	Nonconformances are recorded to permit defect analysis. (I.4.13.3)
7.	Reworked products are reinspected and/or tested according to the Control Plan. (I.4.13.2)
8.	Repair/rework instructions are accessible and utilized by the appropriate personnel. (I.4.13.3)
9.	Where applicable, approvals are obtained for products supplied for service applications that may have visible rework. (I.4.13.3)
10.	Systems ensure that customer authorization is received prior to shipping nonconforming material. (I.4.13.4)
11.	Records are maintained of the expiration dates for engineering approved product authorizations (EAPAs) and quantities authorized. (I.4.13.4)
4.14 CORRECTIVE AND PREVENTIVE ACTION	
1.	Appropriate corrective actions are developed to eliminate causes of nonconformances? (I.4.14.2.c)
2.	Disciplined problem solving methods are used. (I.4.14.1)
3.	Customer complaints and reports of nonconformances are effectively handled. (I.4.14.2.a)

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TABLE 1	
4.	Causes of nonconformances are investigated and the results documented. (I.4.14.2.b)
5.	Effectiveness of corrective action is verified. (I.4.14.2.d)
6.	Returned parts from customer's locations are analyzed and corrective actions are initiated. (I.4.14.2)
7.	Nonconformance reports, (e.g. product quality, deviation, audit result, quality records, etc.) are used to develop preventive actions. (I.4.14.3.a)
8.	Relevant information on actions taken including changes to procedure are submitted for management review. (I.4.14.3.d)
4.15 HANDLING, STORAGE, PACKAGING, PRESERVATION AND DELIVERY	
1.	Material handling methods prevent product damage and deterioration. (I.4.15.2)
2.	Storage areas are appropriate for preventing damage or deterioration of the product. (I.4.15.3)
3.	When required by the nature of the product, the condition of product in stock is checked at intervals to detect deterioration. (I.4.15.3)
4.	Systems control the packing, packaging, and marking processes to the extent necessary to ensure product conformance to specifications. (I.4.15.4)
5.	Applicable customer packaging standards are available, (I.4.15.4)
6.	Compliance to applicable customer packaging standards. (I.4.15.4)
7.	Appropriate methods are used for product preservation and segregation. (I.4.15.5)
8.	Systems ensure the protection of product quality during delivery to the destination. (I.4.15.6)
9.	Appropriate analyses and corrective actions are used when scheduled delivery performance is not 100%. (I.4.15.6)
10.	Inventory management system optimizes inventory turns and stock rotation. (I.4.15.6)
4.16 CONTROL OF QUALITY RECORDS	

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TABLE 1	
1.	Records show effective operation of the quality system, including pertinent sub-contractor quality records. (I.4.16)
2.	Quality records are legible and readily retrievable. (I.4.16)
3.	Quality records (hardcopy or electronic) are stored in a suitable environment to prevent deterioration, damage, or loss. (I.4.16)
4.1	Quality records are retained per established procedures. (I.4.16)
4.2	Quality records include production part approval, control charts, internal quality audits, and failure mode and effects analysis (FMEAs). (I.4.16)
5.	Quality records are available to the customer. (I.4.16)
6.	Systems ensure retention control and timely disposal of quality records. (I.4.16)
4.17 INTERNAL QUALITY AUDITS	
1.	Internal quality system audits are conducted as planned. (I.4.17)
2.	Personnel conducting the audit are independent of the function being audited. (I.4.17)
3.	Audits are scheduled on the basis of the status and importance of the activity. (I.4.17)
4.	Audit results are documented and brought to the attention of the responsible personnel. (I.4.17)
5.	Corrective actions are timely, recorded, and evaluated for effectiveness. (I.4.17)
6.	Audits include work environment and general housekeeping. (I.4.17)
4.18 TRAINING	
1.	Training needs for all personnel performing activities affecting quality are met. (I.4.18)
2.	Qualifications for jobs affecting quality include identification of appropriate education, training needs, and experience. (I.4.18)
3.	Training records are maintained. (I.4.18)
4.	Training effectiveness is periodically evaluated. (I.4.18)
4.19 SERVICING	

BNSDOCID: <WO___9952039A1_I_>

TABLE 1	
1.	Servicing meets the specified requirements. (I.4.19)
2.	Reporting and verification systems are established to communicate data from servicing functions to supplier manufacturing, engineering and design activities. (I.4.19)
	4.20 STATISTICAL TECHNIQUES
1.	Need of statistical techniques for establishing, controlling, and verifying the capability of process parameters and product characteristics has been identified. (I.4.20.1)
2.	Procedures are established and maintained to implement and control the application of statistical techniques. (I.4.20.2)
3.	Advanced quality planning is used to determine the appropriate statistical techniques. (I.4.20.2)
4.	Concepts of variation, control (stability), capability, and over-control are understood throughout the organization. (I.4.20.2)
	II.1 PRODUCTION PART APPROVAL PROCESS
1.	Complete supporting data exists for all production part approval submissions.
2.	Supporting data shows conformance to all customer requirements, including change notification. (I.4.9.6,II.1)
3.	Supporting data is organized and filed together for each part.
4.	Materials are purchased from customer approved subcontractor list. (I.4.6.1)
	II.2 CONTINUOUS IMPROVEMENT
1.	Continuous quality and productivity improvement efforts are a key element of the company's business.
2.	Specific improvement projects have been identified.
3.	Appropriate measurables are identified for improvement projects.
4.	Evidence of improvement in project measurables exists over relevant time periods (from six months to five years).
	II.3 MANUFACTURING CAPABILITIES

BNSDOCID: <WO__9952039A1_I_>

TABLE 1	
1.	Cross-functional teams are used for facilities, equipment, and process planning in conjunction with the advanced quality planning process.
2.	Plant layout minimizes material travel and handling, facilitating synchronous material flow, and maximizing value added use of floor space.
3.	Mistake proofing techniques are utilized where appropriate.
4.	Resources are available for tool and gage design (If subcontracted, rate the tracking and follow-up system).
5.	Resources are available for tool and gage fabrication (If subcontracted, rate the tracking and follow-up system).
6.	Resources are available for complete tool and gage dimensional inspection (If subcontracted, rate the tracking and follow-up system).
7.	Resources are available for tool and gage maintenance and repair (If subcontracted, rate the tracking and follow-up system).

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Sect.	Category	EML 1	TMI	+/-	EML 2	TMI	+/-	EML 3	TMI	+/-	EML 4	TMI	+/-	EML 5	TMI	+/-
4.1	MANAGEMENT RESPONSIBILITY	62.2%	49.49%	-12.74%	62.22%	66.37%	4.15%	15.56%	22.46%	6.90%	26.67%	29.43%	2.76%	28.89%	39.25%	10.36%
4.2	QUALITY SYSTEM	48.33%	36.55%	-11.78%	71.67%	41.18%	-30.49%	13.33%	14.38%	1.04%	35.00%	32.26%	-2.74%	51.67%	27.06%	-24.60%
4.3	CONTRACT REVIEW	40.00%	56.19%	16.19%	55.00%	60.00%	5.00%	10.00%	0.00%	-10.00%	40.00%	21.08%	-18.92%	50.00%	75.56%	25.56%
4.4	DESIGN CONTROL	n/a	n/a	n/a	68.00%	21.79%	-46.21%	30.67%	16.42%	-14.24%	12.00%	17.18%	5.18%	n/a	n/a	n/a
4.5	DOCUMENT AND DATA CONTROL	50.00%	41.65%	-8.35%	56.67%	68.00%	11.33%	0.00%	12.11%	12.11%	43.33%	49.44%	6.11%	46.67%	41.92%	-4.75%
4.6	PURCHASING	28.57%	23.40%	-5.17%	42.86%	29.47%	-13.39%	0.00%	20.00%	20.00%	2.86%	10.00%	7.14%	30.00%	43.44%	13.44%
4.7	CONTROL OF CUSTOMER SUPPLIED PRODUCT	20.00%	47.60%	27.60%	66.67%	49.20%	-17.47%	11.43%	20.00%	8.57%	53.33%	22.60%	-30.73%	66.67%	60.17%	-6.50%
4.8	PRODUCT IDENTIFICATION AND TRACEABILITY	60.00%	72.14%	12.14%	60.00%	80.00%	20.00%	20.00%	10.00%	-10.00%	40.00%	50.00%	10.00%	70.00%	77.33%	7.33%
4.9	PROCESS CONTROL	55.00%	41.76%	-13.24%	60.00%	59.73%	-0.27%	20.00%	18.67%	-1.33%	46.67%	47.59%	0.92%	65.71%	56.94%	-8.78%
4.10	INSPECTION AND TESTING	56.67%	41.26%	-15.41%	76.00%	54.55%	-21.45%	20.00%	15.04%	-4.96%	52.00%	36.55%	-15.45%	66.67%	43.96%	-22.70%
4.11	INSPECTION, MEASURING, AND TEST EQUIPMENT	34.55%	48.40%	13.85%	43.64%	51.89%	8.25%	10.00%	18.08%	8.08%	40.00%	39.67%	-0.33%	55.00%	70.58%	15.58%
4.12	INSPECTION AND TEST STATUS	60.00%	76.00%	16.00%	80.00%	80.00%	0.00%	20.00%	15.07%	-4.93%	40.00%	66.60%	26.60%	73.33%	72.80%	-0.53%
4.13	CONTROL OF NONCONFORMING PRODUCTS	50.00%	53.56%	3.56%	80.00%	42.58%	-37.42%	22.00%	13.82%	-8.18%	60.00%	62.11%	2.11%	44.44%	50.37%	5.92%
4.14	CORRECTIVE AND PREVENTIVE ACTION	50.00%	56.91%	6.91%	77.50%	61.49%	-16.01%	30.00%	22.37%	-7.63%	20.00%	40.17%	20.17%	30.00%	66.51%	36.51%
4.15	HANDLING, STORAGE, PACKAGING, PRESERVATION &	66.00%	52.56%	-13.44%	77.78%	45.36%	-32.42%	52.50%	28.51%	-23.99%	35.00%	30.53%	-4.47%	70.00%	62.22%	-7.78%
4.16	CONTROL OF QUALITY RECORDS	50.00%	42.23%	-7.77%	50.00%	59.47%	9.47%	6.67%	12.62%	5.95%	73.33%	56.73%	-16.60%	70.00%	71.47%	1.47%
4.17	INTERNAL QUALITY AUDITS	20.00%	20.00%	0.00%	0.00%	2.00%	2.00%	0.00%	12.26%	12.26%	3.33%	12.00%	8.67%	0.00%	42.60%	42.60%
4.18	TRAINING	53.33%	44.00%	-9.33%	13.33%	20.00%	6.67%	53.33%	12.79%	-40.55%	0.00%	15.00%	15.00%	46.67%	57.60%	10.93%
4.19	SERVICING	n/a	n/a	n/a	n/a	n/a	n/a	0.00%	10.00%	10.00%	n/a	n/a	n/a	n/a	n/a	n/a
4.20	STATISTICAL TECHNIQUES	50.00%	54.73%	4.73%	70.00%	72.13%	2.13%	0.00%	10.00%	10.00%	15.00%	27.13%	12.13%	25.00%	28.13%	3.13%
II.1	PRODUCTION PART APPROVAL PROCESS	73.33%	63.94%	-9.39%	75.00%	80.00%	5.00%	25.00%	15.00%	-10.00%	70.00%	65.87%	-4.13%	65.00%	67.20%	2.20%
II.2	CONTINUOUS IMPROVEMENT	35.00%	74.67%	39.67%	75.00%	37.33%	-37.67%	5.00%	11.95%	6.95%	30.00%	20.27%	-9.73%	45.00%	55.20%	10.20%
II.3	MANUFACTURING CAPABILITIES	56.67%	44.18%	-12.49%	76.00%	28.44%	-47.56%	46.67%	14.54%	-32.12%	44.00%	10.00%	-34.00%	73.33%	0.00%	-73.33%
	Average	48.56%	49.58%	1.03%	60.79%	50.50%	-10.29%	17.92%	15.05%	-2.87%	35.57%	34.65%	-0.92%	51.15%	52.87%	1.73%
															Average	-2.27%

TABLE 2

CLAIMS

1. A method of using a computer to gather information about an organizational process or system, comprising:

displaying on a display device a plurality of questions, the questions being adapted to prompt an assessor to input on an input device of the computer the assessor's perceptions of the organizational process or system, wherein the assessor has at least some knowledge about the organizational process or system;

receiving a plurality of inputs from the input device, wherein the inputs are stored in a memory;

comparing within a processing unit of the computer the inputs to a plurality of values, and, if the inputs have first predetermined characteristics in relation to the values, then prompting the assessor to identify evidence supporting the inputs, and if the supporting evidence is identified, then validating the inputs for subsequent evaluation, and if the supporting evidence is not identified, then inhibiting validation of the inputs until the evidence is identified or until the inputs are changed to have second predetermined characteristics in relation to the values;

analyzing the inputs to determine if one or more undesirable trends are present in the organizational process or system;

displaying on the display device corrective action computer-driven questions, the corrective action questions being adapted to prompt the assessor to input on the input device the assessor's perception of the undesirable trend of the organizational process or system; and

receiving a plurality of corrective action inputs, the corrective action inputs being stored in the computer's memory.

BNSDOCID: <WO___9952039A1_I_>

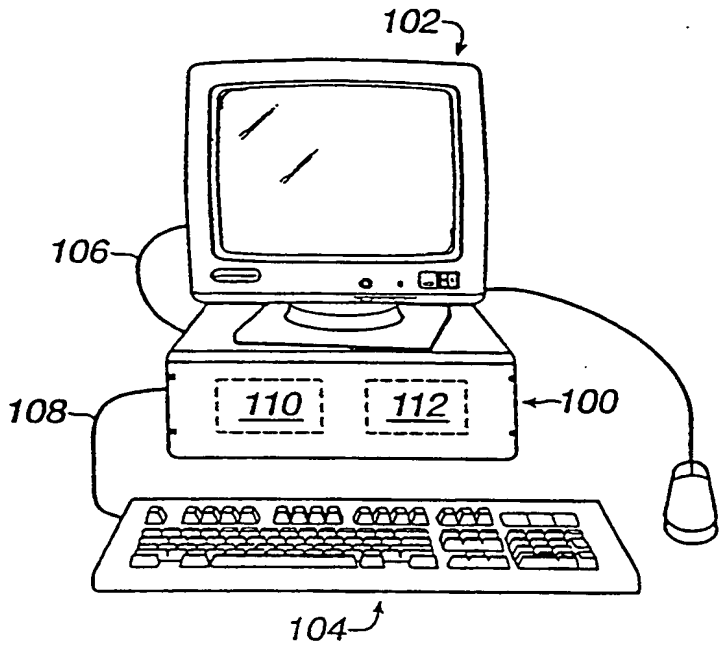


Fig. 1

BNSDOCID: <WO___9952039A1_I_>

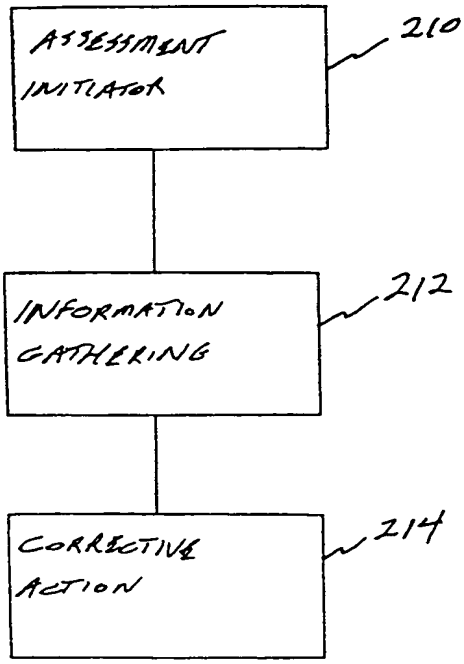


FIG. 2

BNSDOCID: <WO___9952039A1_I_>

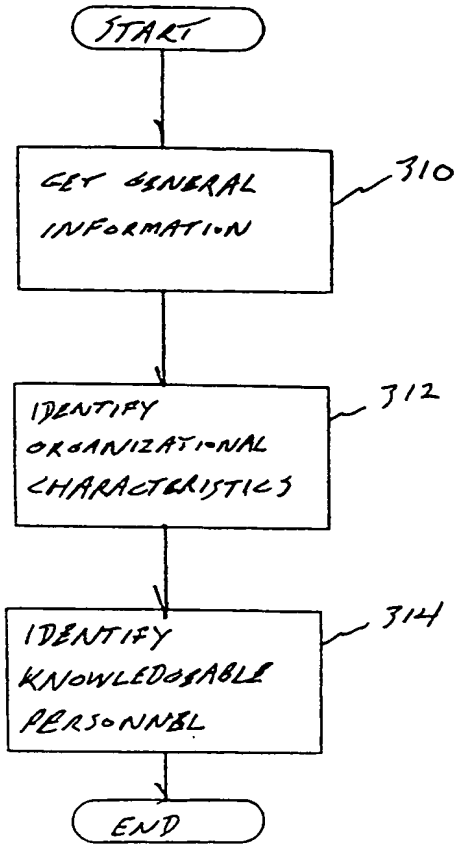
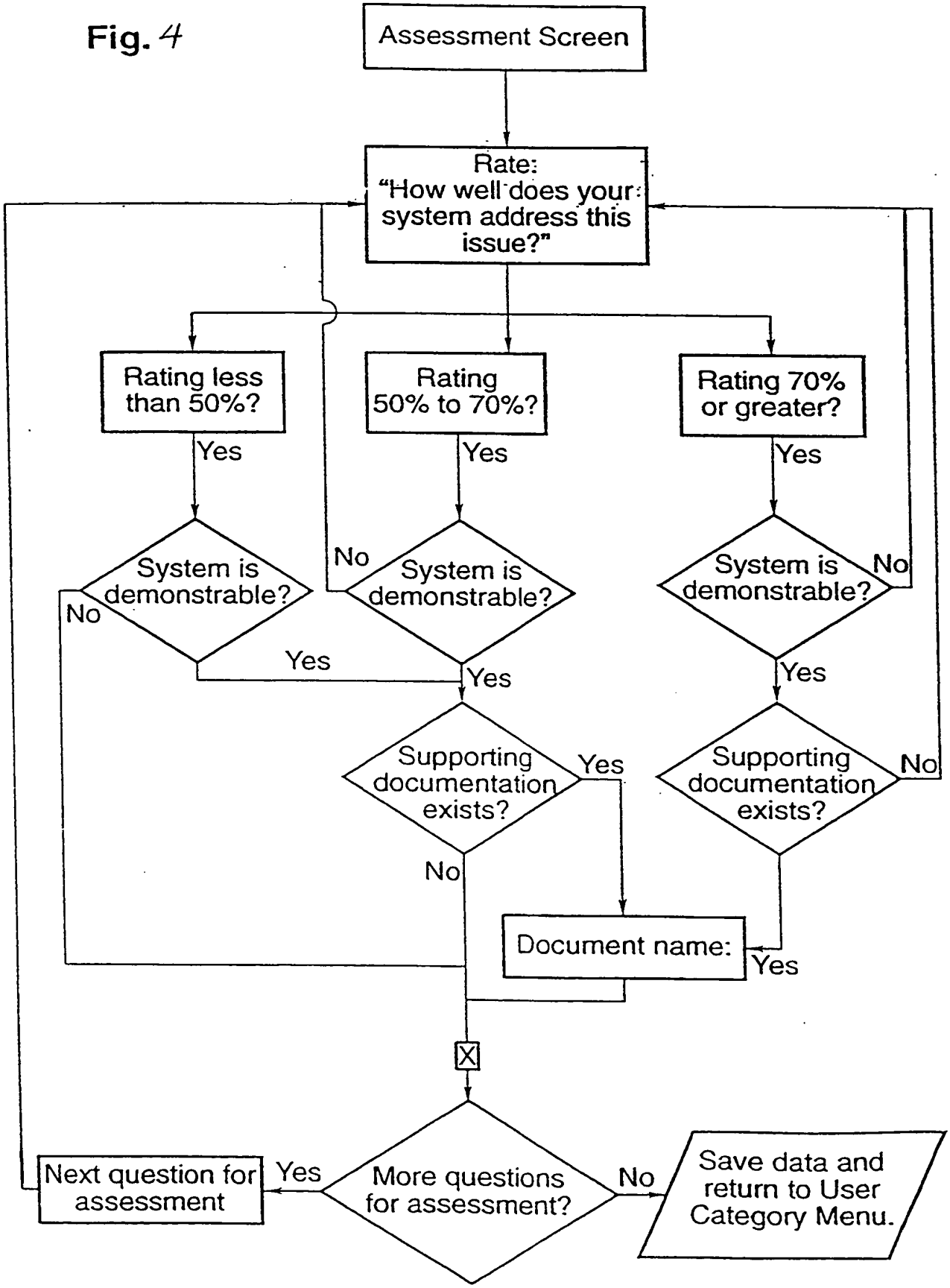


FIG. 3

BNSDOCID: <WO___9952039A1_I_>

Fig. 4



BNSDOCID: <WO___9952039A1_I_>

Fig. 5

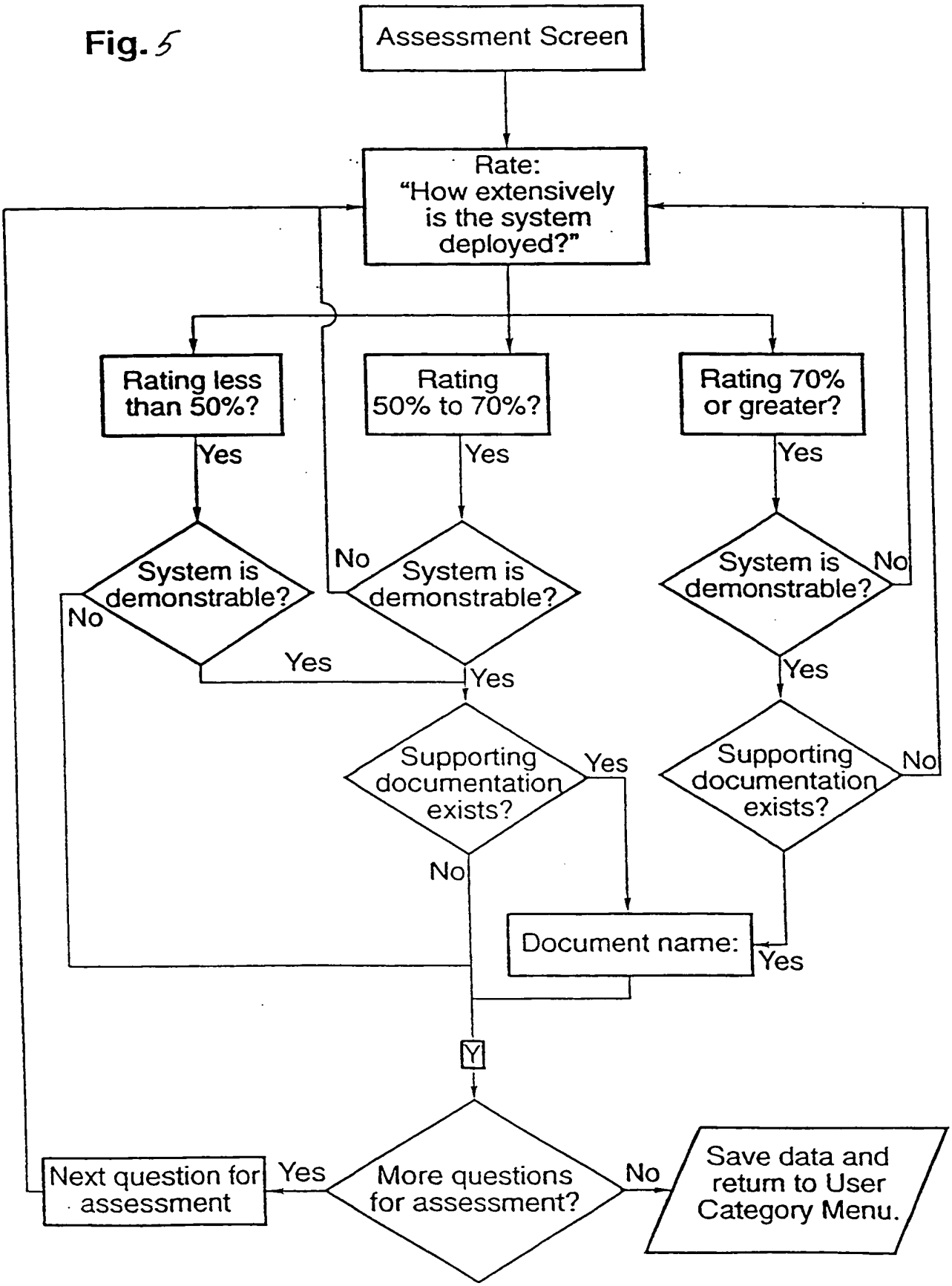


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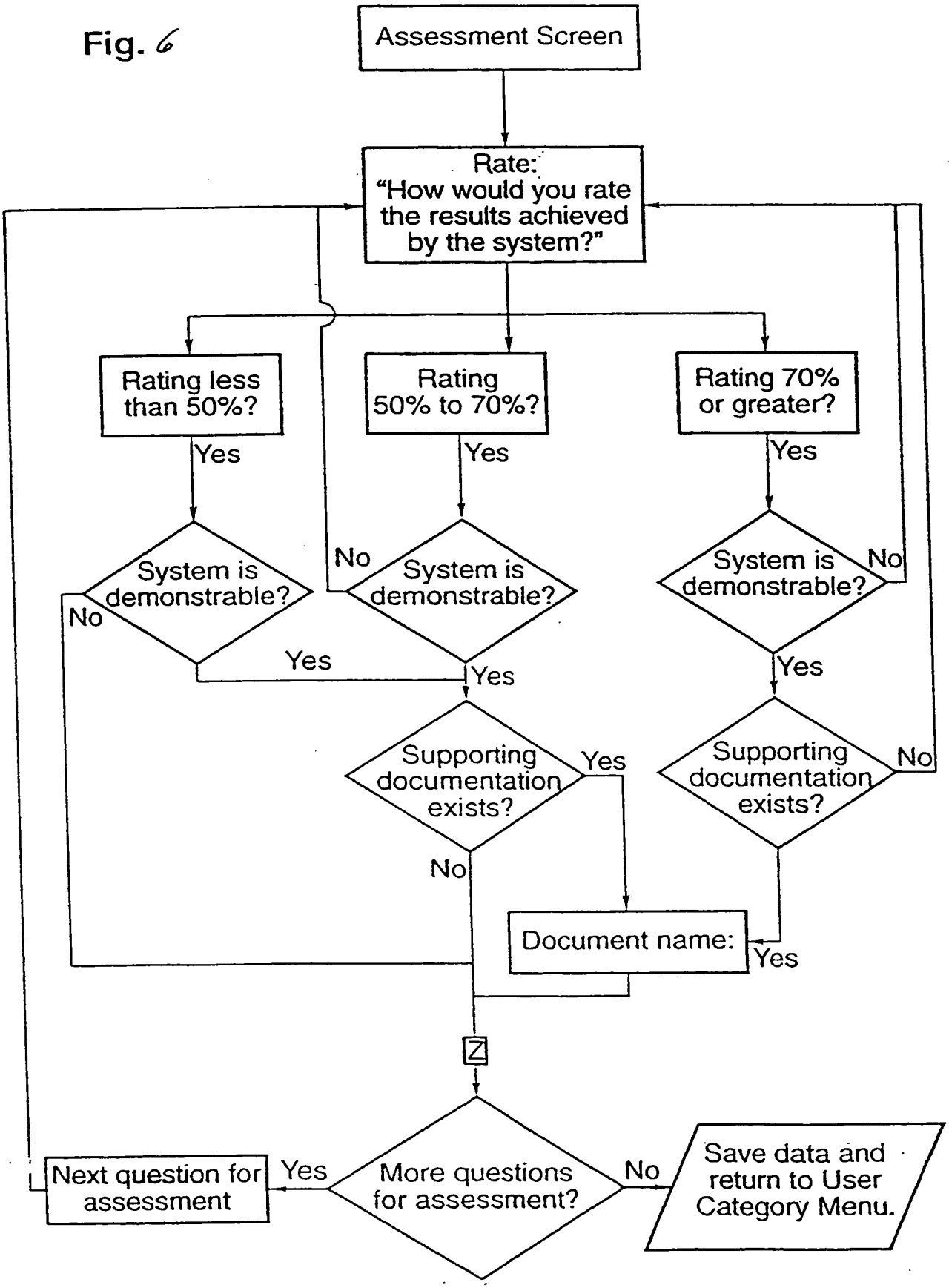
Fig. 6


Assessment Screen
Rate: "How would you rate the results achieved by the system?"
Rating less than 50%?
Rating 50% to 70%?
Rating 70% or greater?
Yes
Yes
Yes
System is demonstrable?
No
System is demonstrable?
No
System is demonstrable?
No
Yes
Yes
Yes
Supporting documentation exists?
Yes
Supporting documentation exists?
No
No
Document name:
Yes
Z
Next question for assessment
Yes
More questions for assessment?
No
Save data and return to User Category Menu.

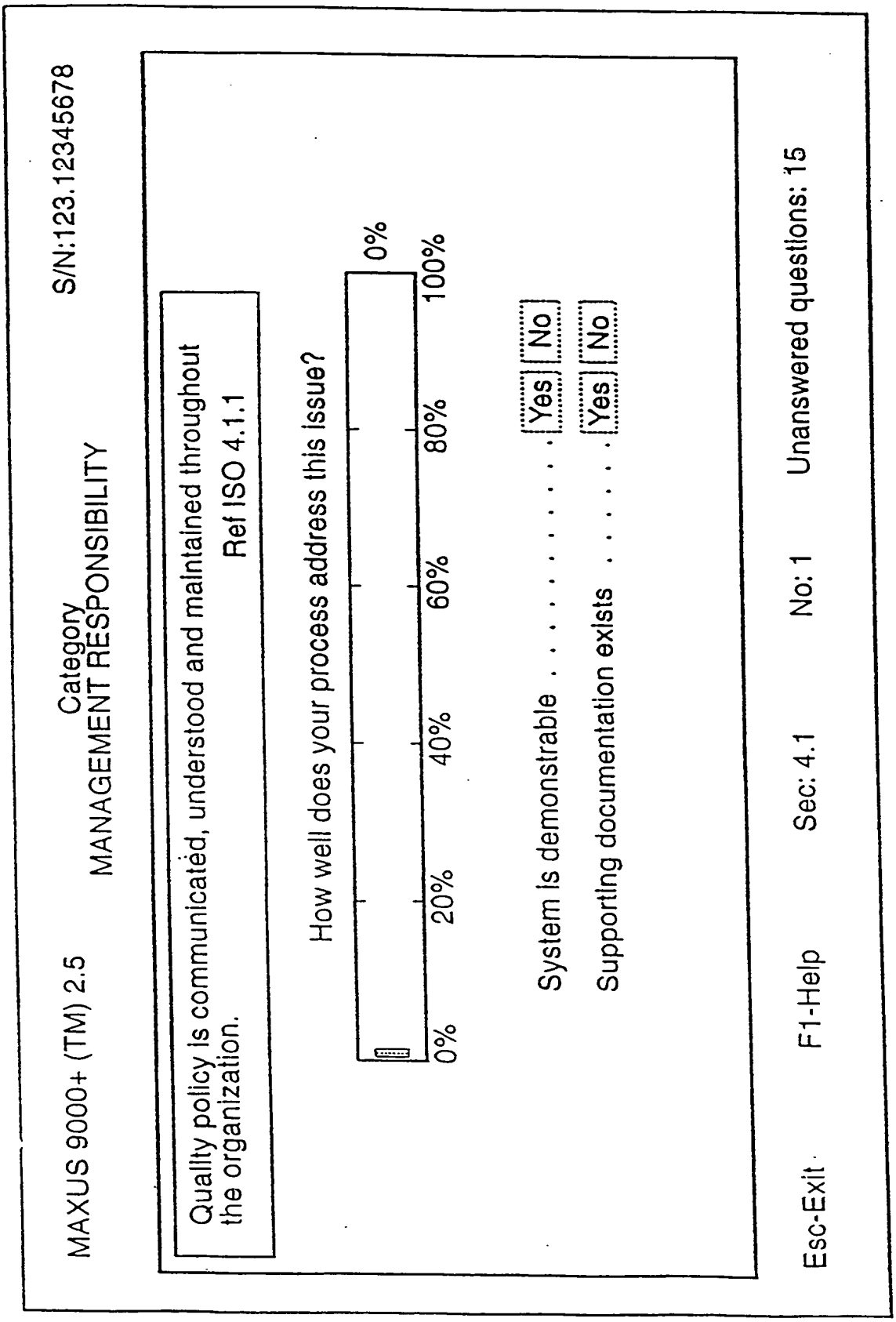


Fig. 7A

BNSDOCID: <WO___9952039A1_I_>

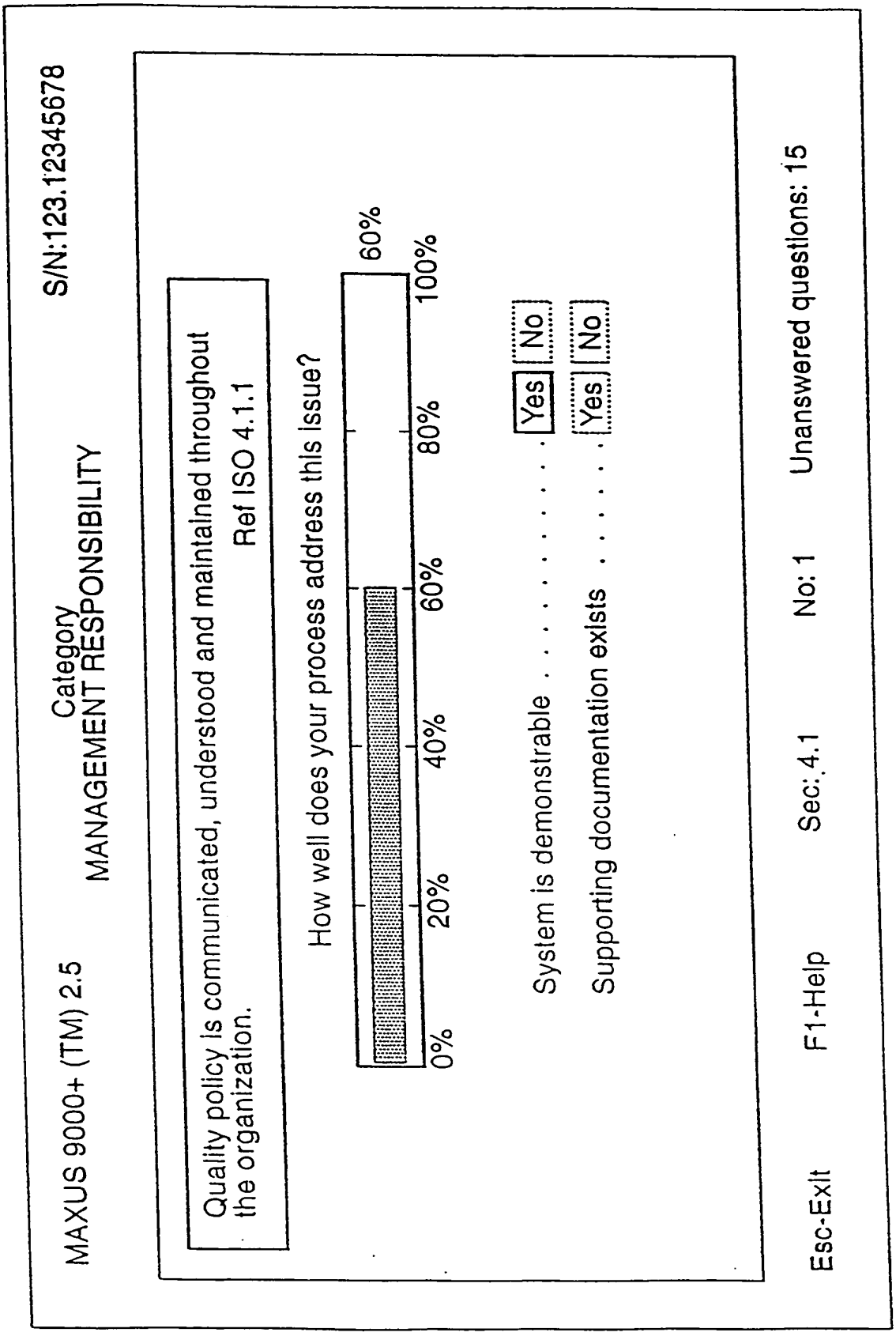


Fig. 7B

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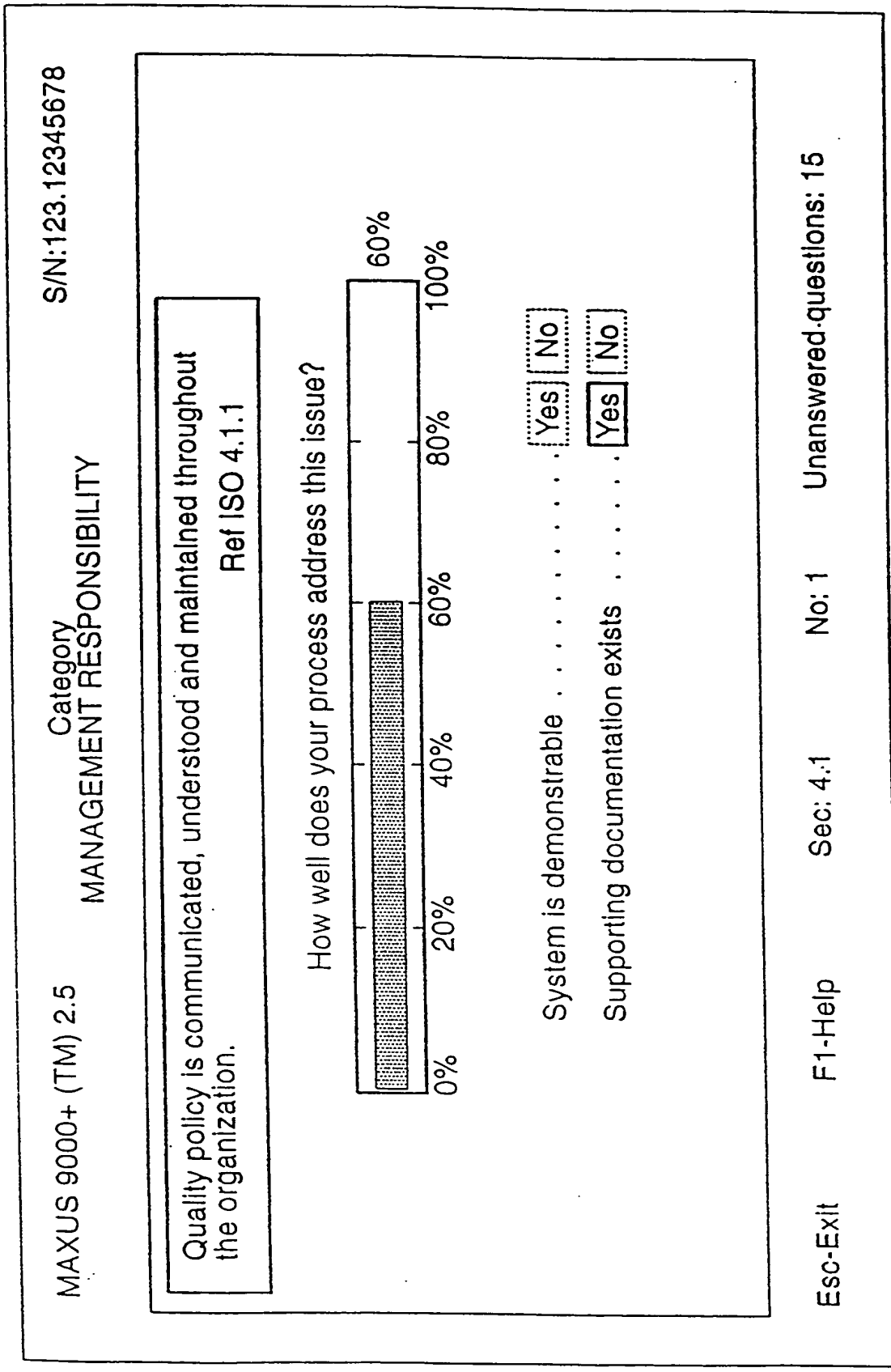

Fig. 7C

BNSDOCID: <WO___9952039A1_I_>

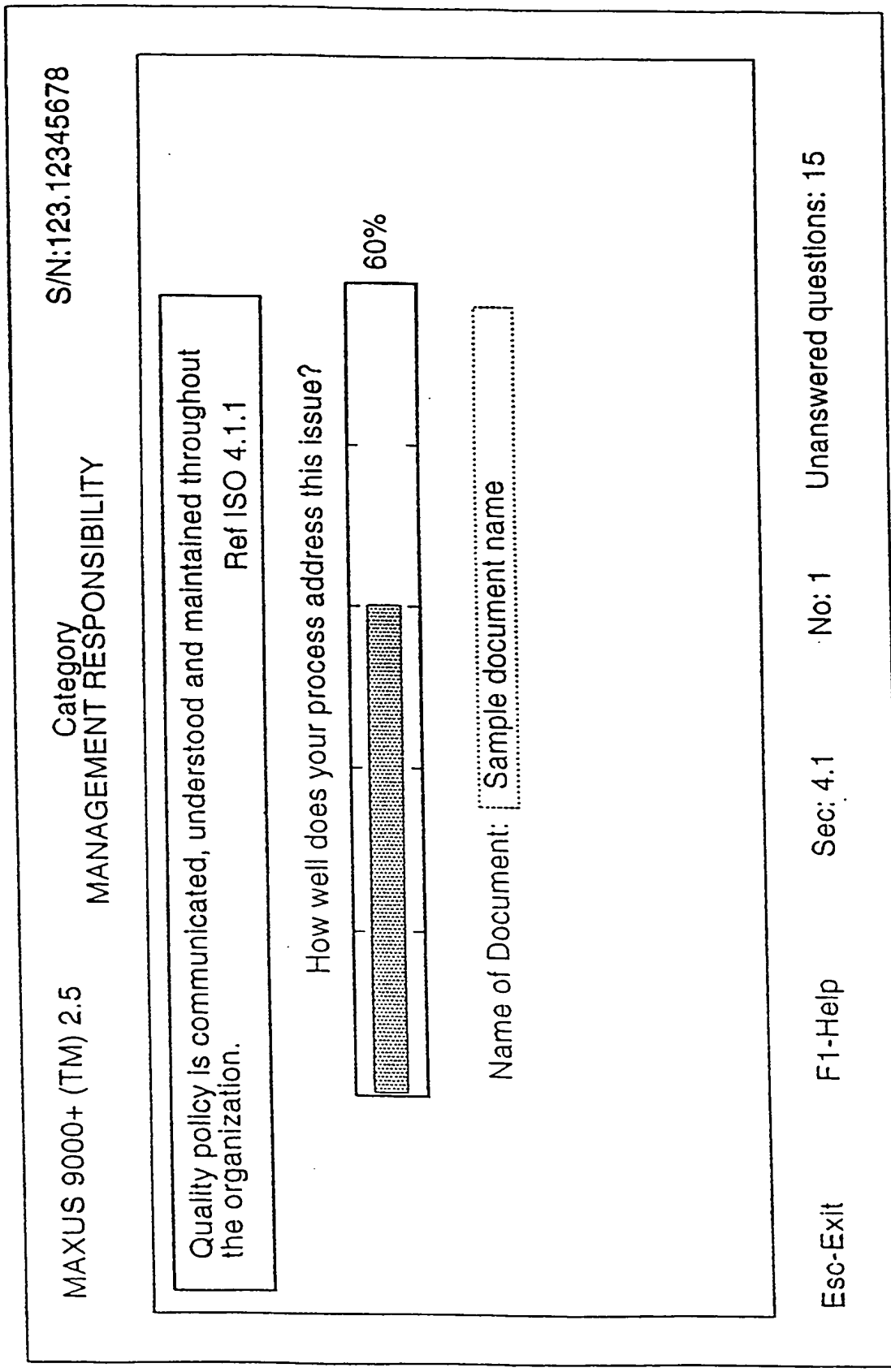

Fig. 7D

BNSDOCID: <WO___9952039A1_I_>

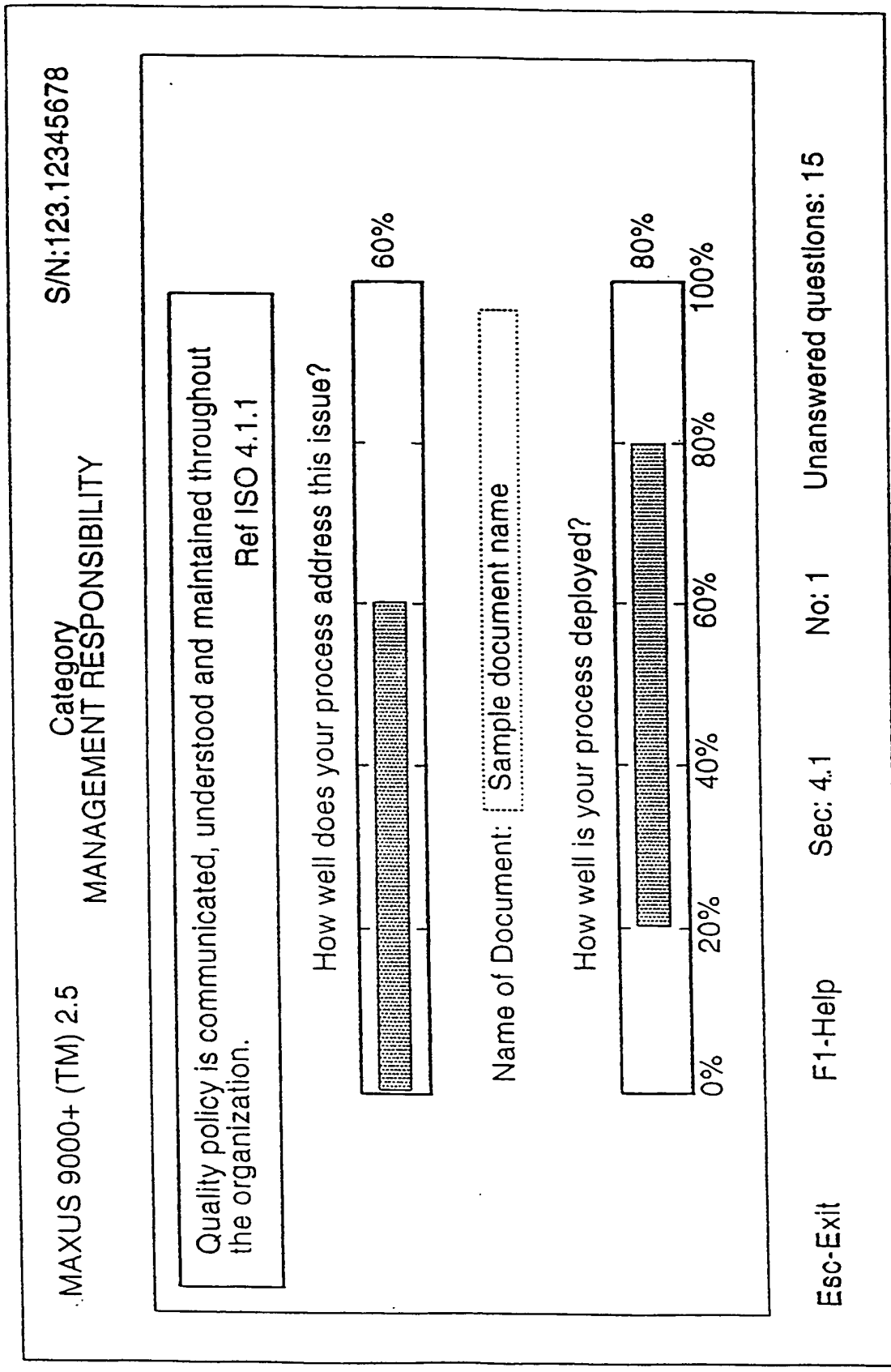

Fig. 7E

BNSDOCID: <WO___9952039A1_I_>

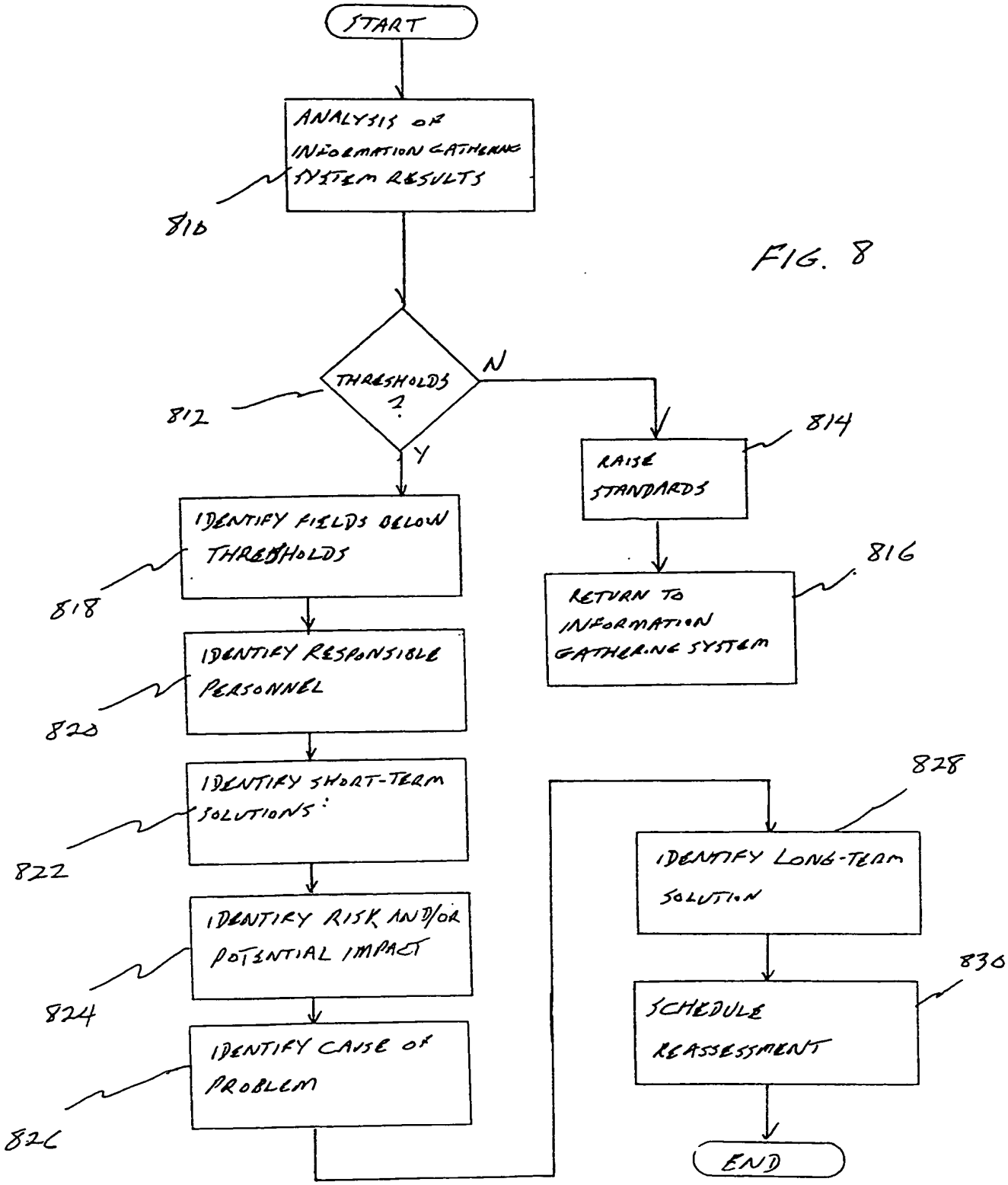
START
ANALYSIS OF INFORMATION GATHERING SYSTEM RESULTS
810
THRESHOLDS ?
812
N
Y
RAISE STANDARDS
814
RETURN TO INFORMATION GATHERING SYSTEM
816
IDENTIFY FIELDS BELOW THRESHOLDS
818
IDENTIFY RESPONSIBLE PERSONNEL
820
IDENTIFY SHORT-TERM SOLUTIONS
822
IDENTIFY RISK AND/OR POTENTIAL IMPACT
824
IDENTIFY CAUSE OF PROBLEM
826
IDENTIFY LONG-TERM SOLUTION
828
SCHEDULE REASSESSMENT
830
END

FIG. 8

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US99/07505

A. CLASSIFICATION OF SUBJECT MATTER
IPC(6) :G06F 15/18
US CL :706/45
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
U.S. : 706/45

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
NONE

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
IEEE (IEL), ACM DL, STN (INSPEC), APS
search terms: expert system, assessment, evaluation, check, validate, answer, question

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 4,809,219 A (ASHFORD et al) 28 February 1989, see col. 9, lines 13-31.	1
A	US 4,849,879 A (CHINNASWAMY et al) 18 July 1989.	1
A	US 4,972,328 A (WU et al) 20 November 1990, see col. 5, lines 60-68.	1
A	US 5,781,704 A (ROSSMO) 14 July 1998.	1
A	DUTTON, P.I., SMITH, R.A., Mthodology for Developing an Assessment Expert System using a Planning Paradigm, Proc. IEEE 1989 National Aerospace and Electronics Conference, May 1989, pages 1053-1060.	1

[X] Further documents are listed in the continuation of Box C. [ ] See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
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"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search
27 MAY 1999

Date of mailing of the international search report
23 JUN 1999

Name and mailing address of the ISA/US
Commissioner of Patents and Trademarks
Box PCT
Washington, D.C. 20231
Facsimile No. (703) 305-3230

Authorized officer
ROBERT DOWNS
Joni Hill
Telephone No. (703) 305-9642

Form PCT/ISA/210 (second sheet)(July 1992)*

BNSDOCID: <WO___9952039A1_I_>

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US99/07505

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	HYMAN, W.A., MITTA, D.A., Statistical Analysis of the Effect of Input Errors on Expert System Advice, Proc. of the Annual Intl. Conf. of the IEEE Engineering in Medicine and Biology Society, November 1989, Vol. 6, pages 1771-1772.	1
A	HOOGENDOORN, E.L., et al., A PC-Based Interface for an Expert System to Assist with Preoperative Assessments, Proc. of the Fourth Annual IEEE Symp. Computer-Based Medical Systems, May 1991, pages 251-257.	1
A	NEERINCX, M., de GREEF, P., How to Aid Non-Experts, Conf. proceedings on Human Factors in Computing Systems, April 1993, pages 165-171.	1
A	MEHLENBACHER, B., et al., Software Usability: Choosing Appropriate Methods for Evaluating Online Systems and Documentation, Proc. of the 11th Annual Int'l. Conf. on Systems Documentation, 1993, pages 209-222.	1
A	JONES, D.W., Simulation of Information Flow in Organizations, Proc. of the 1993 Winter Simulation Conf., 1993, pages 1388-1389.	1
A	LLOYD, B.A., et al., Motor Insulation Condition Assessment Using Expert System Software, Conf. Record of 1994 Annual Pulp and Paper Industry Technical Conf., June 1994, pages 60-67.	1
A	MADACHY, R.J., System Dynamics Modeling of an Inspection-Based Process, Proc. of the 18th Int'l. Conf. on Software Engineering, 1996, pages 376-386.	1

BNSDOCID: <WO___9952039A1_I_>